UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN UTILIZATION RESEARCH BRANCH

Proceedings

of

FOURTH COTTONSEED PROCESSING CLINIC

AT THE

SOUTHERN REGIONAL RESEARCH LABORATORY

NEW ORLEANS, LOUISIANA

IN COOPERATION WITH

VALLEY OILSEED PROCESSORS' ASSOCIATION

FEBRUARY 7-8, 1955

FOREWORD

These proceedings are a summary of the information presented at the Fourth Cottonseed Processing Clinic held at the Southern Regional Research Laboratory, New Orleans, Louisiana, February 7-8, 1955.

Sponsored jointly by the Southern Regional Research Laboratory and the Valley Oilseed Processors' Association, this working conference was attended by eighty-six representatives of cottonseed oil mills, equipment manufacturers, commercial laboratories, users of cottonseed products, and state agencies, in addition to staffmembers of the Southern Laboratory. The program for the first day was arranged and conducted by staff members of the Southern Laboratory and for the second day by officials of the Association.

Major attention at the Clinic was focused on the production of high quality linters, increased nutritive value of cottonseed meal, high quality of cottonseed oil, and continued cooperation between industry and research.

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WELCOME

By

C. H. Fisher, Chief
Southern Utilization Research Branch

Again it is my privilege and pleasure to welcome you--for both the Southern Utilization Research Branch and myself--to the Oilseed Processing Clinic. We thank the Valley Oilseed Processing Association for the privilege of co-sponsoring the Clinic; we are grateful to each conferee for coming to New Orleans to participate in these discussions.

Because the Southern Branch is a research organization, we look to it for direct contributions to Southern agriculture in the form of research developments. For this reason, some of us might appreciate inadequately the indirect but major contributions afforded by conferences of the type being held here during the next two days. These conferences serve as a common meeting ground for representatives of industry, schools, State and Federal groups and other organizations. At conferences held here, many viewpoints and much information on research problems--and their solution--are exchanged. New ideas and enthusiasm are created. The net gain is great. About twenty conferences similar to the Oilseed Processing Clinic were held in the Southern Branch last year. We in the Southern Branch are convinced that these conferences are very beneficial.

Valuable information is exchanged also when we are visited by individual members of industry, schools and other groups. Not all our visitors (nearly 5000 last year) have technical interests, but many of them do.

I should like to take a few minutes of your time to present some highlights of our operations during the past year.

First, our appropriations for fiscal year 1955 contained an increase in funds. This naturally has been pleasing to us because of the implied confidence in our work and because we shall be enabled to give more attention to urgent problems in agriculture. While it is generally difficult--because of the supply-demand situation--to acquire the services of able scientists, we have already been successful in getting the good men needed for the new work.

During the past year we were fortunate in being able to fill the important position of Assistant Chief of the Branch with a competent and experienced scientist and administrator. Dr. Gilbert E. Goheen resigned his position of Director of Research and Development at J. T. Baker Chemical Company to accept the position of Assistant Chief, SURB. Dr. Goheen received his Ph.D. in organic chemistry at the U. of Iowa in 1938. He held important positions at Sun Oil Company and General Aniline & Film Company--assistant to or associate director of research for 10 years at the latter company-prior to his association with J. T. Baker Chemical Company.

Because our Engineering and Development Section, headed by Mr. E. A. Gastrock, does much work on oilseed processing, you might be interested in developments in this Section during the past year. Dr. E. Fred Pollard

has been made Assistant Head. In this position, he will play a more important role in both the technical and administrative activities of the Section. The four Units of the Section and their Unit Supervisors are: Product Development Unit (J. Spadaro); Process Development Unit (H.L.E.Vix); Industrial Analysis Unit (K. Decossas); and Cotton Unit (acting supervisor N. E. Berard).

We have taken action in cooperation with Federal Extension Service that will increase the efficiency with which the results of some of our research will be put to work. Mr. Wm. J. Martin, a cotton expert in FES, has been given the assignment of working with us to accelerate the rate at which cotton mills adopt and use the findings of utilization research. In addition to taking information to industry about research, Mr. Martin will bring to us information that will help us fit our research program more closely to the needs of the cotton industry.

In closing, I wish to thank Dr. E. Fred Pollard and others who have worked hard and effectively to arrange this Clinic. I also wish to express again the hope that your visit to New Orleans and participation in the Clinic will be unusually pleasant and profitable. Thank you.

RESPONSE

By

I. H. Fleming, Jr., President
Valley Oilseed Processors' Association
De Soto Oil Company
Memphis, Tennessee

Thank you Dr. Fisher.

On behalf of the members of the Valley Oilseed Processing Association, and also I am sure I speak for the rest of us, I want to thank you and your staff for the opportunity of meeting here again for the Fourth Cottonseed Processing Clinic. Our past meetings made possible by you have been interesting and profitable, and I am sure this meeting and others to come will help materially to bring about progress in our industry.

SOUTHERN REGIONAL RESEARCH LABORATORY
PRESENTATIONS ON COTTONSEED RESEARCH

AND

GUEST DISCUSSIONS OF INDUSTRY PROBLEMS

STATUS ON RESEARCH ON IMPROVING NUTRITIVE VALUE OF COTTONSEED MEAL

By

A. M. Altschul
Southern Regional Research Laboratory

This is a progress report on the cooperative research program which has been underway for some time with the objective of improving the nutritive value of cottonseed meal for nonruminants and on the work at the Southern Regional Research Laboratory which was part of this program. You will remember that cottonseed meal until very recently was used little, if at all, in feeds for poultry and swine and mixed feeds. A research program was begun to determine whether, through processing, the quality of cottonseed meal could be improved so that it could be fed in unrestricted quantities to nonruminants. A cooperative research program involving our laboratory, other research institutions, state experiment station laboratories, industrial mills and laboratories, the Fellowship Program of the National Cottonseed Products Association and its Educational Service was begun. Three public meetings were held in 1950, 1951, and 1953 to review the results of research and to recommend the new directions of research. In November, 1953, progress had been sufficient so that the conference could feel secure in suggesting tentatively that when cottonseed meal which is properly processed is mixed with soybean meal on an equal nitrogen basis, growth in chicks and swine was supported as well if not superior to that which occurred when either one of these meals was used alone.

This resolution had two profound effects. It raised the status of cottonseed meal and provided a formula for using it in poultry and mixed feeds. It stimulated the interest of the cottonseed meal producers in adjusting their processing conditions so as to produce meals which more nearly conformed to the standards set by the Conference. Secondly, this resolution stimulated considerable research to prove or disprove the statements made.

In the 1954 season it is estimated that from 150 to 250,000 tons of cottonseed meal went into new markets as poultry and swine feeds. There was, of course, an unusual price situation between cottonseed meal and soybean meal which promoted such an effort. Nevertheless, this could not have been possible if cottonseed meal had not achieved the new status among nutritionists as a result of this cooperative program and if the processors had not learned to do as good a job as possible in making improved meals. It is not known whether the situation which occurred in 1954 will repeat itself, but I think it can be said that cottonseed meal is here to stay in new markets whenever the economics are favorable.

It might be worthwhile recalling the principles upon which the new developments in cottonseed meal are based. They are two; the first is that it is desirable to reduce the toxicity in cottonseed meal for nonruminants to a level where it is safe. At the present time it is felt that this can be achieved by reducing the free gossypol content in the meal to as low a possible level. The second principle is to minimize the heat damage to the meal during processing. Some relationship has

been established between minimum heat damage and solubility of the nitrogen in dilute alkali. This has been a rough measure of the extent of heat damage. While the actual measures of toxicity and heat damage, that is free gossypol content and nitrogen solubility, will unquestionably be modified as the information about cottonseed meal increases, there is reason to believe that these two principles involving minimizing the toxic material as well as minimizing heat damage are sound and will remain. Adherence to these principles has gained many new markets for the cottonseed meal industry which could possibly be extended as time goes on.

Aside from its practical value to the industry, this research program is an interesting example of teamwork between a wide variety of scientists, chemists, nutritionists, practical mill operators, and engineers as well as teamwork between various groups such as exist in government and industry. It is an object lesson of what can be achieved in one industry when such cooperation is achieved. It might well serve as a model in attempts to solve other problems.

THE COLOR PROBLEM OF COTTONSEED OIL

By

F. G. Dollear
Southern Utilization Research Branch

Members of the Cottonseed Processing Clinic. It is encouraging to us to see so many members of the industry present. This would indicate that interest in the Clinic is growing.

In our research at this Laboratory we are concerned with the color of cottonseed oil and we consider color to be the major quality problem is regard to cottonseed oil. I would like to point out some of the reasons we feel that way. I certainly would like to have any discussions, any opinions about its importance as you folks in industry see it; I hope we will have time for discussion on that point. There is no doubt that economic factors have contributed more to our surplus of cottonseed oil than have technological factors. But the color of cottonseed oil has not helped its position. While soybean oil, animal fats, and some of the competitors of cottonseed oil have been getting better, cottonseed oil in general has been getting poorer in terms of color.

One of the reasons that this is an important problem is that the market for oil for shortening has continually demanded a lighter colored product. And as processing conditions have changed in the cottonseed industry from hydraulic to screw-press, pre-press solvent, and direct solvent operations, the tendency has been for the cottonseed oils to be darker in color with greater tendency to revert in color. Some of the work that Dr. Altschul has discussed in regard to improving nutritive value of meal requires lower temperature operation to give higher nitrogen solubility. Generally those types of operations will tend to increase the quantity of pigments in the crude oil.

The penalty or cost of dark colored oils is one thing that might be discussed very briefly here. One thing of course, is the possibility of loss of market, that is, loss of market for shortening, and the use of cottonseed oil in shortening certainly has been decreasing. It goes into markets where color is not so important. Some oils are dark colored and cannot be processed satisfactorily, and others may require additional

handling--additional processing, such as re-refining, additional bleaching, etc. One answer we had was that an oil that required additional re-refining and rebleaching might cost about 3/4 of a cent per lb. additional to process.

We, in the past, have done some work on empirical approach to improve cottonseed oil color and investigated the refining and re-refining of cottonseed oil using a high shear process. You probably are familiar with the work we have done in this field. We did one piece of work on re-refining and last fall we reported at the meeting of the American Oil Chemists' Society some work which was done on high shear refining. That certainly will help the color of most oils but it does not solve all the problems by any means.

Now let us look at color reversion and know that it is a condition where an oil is refined immediately as a crude oil will give a low bleached color, but if you store that oil, particularly at an elevated temperature, and then refine it and bleach it you will get a higher color. I would just like to show you a graph illustrating some work that was done with screw-pressed oils, pressed at different temperatures. The gossypol content of this crude oil was determined and the increase in bleached color when those oils were stored for 40 days at 95 to 100°F. That, of course, is a temperature which favors color reversion. Now, in this plot, the increase in bleached color from 0 to 9 on the left hand side, and along the base from 0 to 1.2% gossypol in the oil, gave a pretty good correlation. A straight line was obtained when the increase in bleach color of oils stored under those conditions was plotted against gossypol content. That was one of the first indications we had that gossypol in the crude oil was responsible for this color reversion phenomenon.

The second confirmation of this evidence was the fact that in experimental cooking in the laboratory using high moisture and alkali in the cooking operation the gossypol is low in the oil that you get out. Under these conditions you get a low bleached color and nonreverting oil.

The third piece of evidence results from the addition of a chemical reagent to the crude oil which reacts with the gossypol. The chemical reagents which we have used in experimental work is para-amino-benzoic acid. We use the abbreviation PABA, rather than of the long chemical term. Now para-amino-benzoic acid is expensive and would not be a practical reagent for commercial operation at the present time because of the cost, but in the Laboratory it has been shown that if you add PABA to a crude oil it will react with the gossypol to form a precipitate that can be easily removed and you get an oil of light color which is not reverting. Other reagents for removing gossypol have been tried, but so far we have found nothing better than this one.

The thing that we feel is important here is that we have definitely shown the fundamental principle that gossypol is responsible for the color reversion of cottonseed oil. We think that this is a principle on which we, or others, can build in improving the processing and getting a better quality oil.

We are continuing to work along the lines of the experimental cooking investigations. We are also working with the crude oil to find out what pigments are present and what the mechanism of color reversion is.

We are working on the identification of the oil pigments because if we can find out something about these pigments, their nature, composition, and how this color reversion phenomenon goes on, I think we will have a much better chance of solving this problem. I might say that Dr. Dechary, who is doing this work, is making considerable progress in fractionating pigments from the oil and I think he will have in the near future some interesting results on that work. Thank you very much and I will be glad to answer any questions you care to ask.

DISCUSSION

Snell: I noticed Dr. Altschul in discussing the nitrogen digestibility you talked principally about the non-ruminant. What effect does nitrogen digestibility have on cattle in the feed?

Altschul: The answer to your question Mr. Snell is that under present feeding practices on cattle nitrogen solubility has absolutely no effect. Cottonseed meal is and has been recognized as a very good supplement for these livestock. When talking about the quality of protein we are talking in terms of quality for swine and poultry.

Henry: Is it necessary to remove PABA compound of gossypol from the oil, or, can the precipitate be left in the oil? If it does have to be removed what is the best way of removing it?

Dollear: It is better to remove the precipitate and prior to any storage of the crude oil. If the compound is removed prior to storage of the crude oil in particular by filtration or centrifugation there is a problem of getting it out in the form of a fine granular solid orange colored material without losing too much oil by occlusion.

Henry: Does the filtering out of PABA account for lower refining losses in the publication covering this subject?

Dollear: Some of the gums that contribute to the refining loss are believed to be removed along with the PABA precipitate. In addition gossypol itself is acidic and may contribute some toward the refining loss.

Newby: You talked concerning the reversion you attributed to gossypol. I believe it is correct to say that in the old style expeller operation when some rather high temperatures are encountered in the expeller barrel or prepress barrel that quite efficient binding of the gossypol in the meal takes place.

Altschul: That is correct. In fact that is the major difference between hydraulic and expeller oils.

Smith: I wonder Dr. Altschul when you were shooting for this high solubility and low gossypol in the normal screw-press operation, if you found the residual oil to be higher in high nitrogen solubility meals than in meals processed in the normal screw-press operation? If so, what is the correlation between the premium expected for the high quality meal, and the oil lost in the meal?

Altschul: There is some relationship between pressure and heat. If higher pressure must be employed in the screw-press to get additional oil more heat will be generated and therefore, there is a relationship between the amount of oil remaining and the nitrogen solubility. I

believe that in the case of the normal screw-press there is a very definite economic problem to solve. The amount of oil that is left must be balanced against the extra value of the meal. In the case of the screw press there is a very definite relationship between the price of the oil and the quality of the meal. There is the possibility that both low residual oil and high nitrogen solubility can be obtained.

Smith: Is the residual oil higher in higher solubility meals?

Altschul: In some of our experiments in Texas in commercial plants a very low residual oil was obtained but by a considerable reduction in the capacity of the press. Low residual oil and high quality meal can be had if reduction in capacity can be afforded.

Norris: When you add PABA to remove gossypol, is that a quantitative reaction, or do you have to add something else besides the PABA to completely remove the gossypol?

Dollear: Those compounds which are determined analytically as gossypol by our best method for determining gossypol are removed. I don't think you will need any appreciable excess of the PABA reagent over that calculated to react with gossypol or materials we determine as gossypol by the analytical method.

Witz: How much PABA must be added to reduce color.

Dollear: At the present time it is not practical due to the high cost. It takes two moles of PABA to one mole of gossypol and from its gossypol content the exact weight required can be calculated in the reaction in the particular oil you are treating.

Altschul: I think the point should be made clear that if you took a crude oil and let it revert by storing it for a certain length of time at a high temperature you couldn't then treat it with PABA and remove the color.

Newby: As I understand it, the improvement is only in color stability. Itdoes not remove any color, it does not help the fresh oil at all, it only allows that oil to be stored without deteriorating. Is that right?

Dollear: That is true, you will find that crude oil if treated immediately, would not improve appreciably upon refining. The stability upon storage is really changed.

French: I would like to comment in relation to Allen Smith's questions and Dr. Altschul's answers, that I wouldn't say the lower extraction improvement in solubility would be possible. There is a lot we don't know about it yet but the interesting factor to me is that there was 3% residual oil, and around 60 protein solubility which indicates that something can be worked out.

Verdery: Mr. Dollear made a statement that the trend in recent years was for lower quality, higher color oil. Over the last four or five years there has been an effort by a lot of oil mills to use screw presses and expellers to do better extraction and a number of solvent plants have been started without knowledge of operations. As a result for two or three years a lot of oil has been ruined. A check last year at four or five expeller plants and 5 solvent plants indicated that the 1953-1954 oils produced were better than have been produced in a long time. After a check with some finished products and refinery people, I think most of us will learn how to get that oil back where it belongs.

COTTONSEED OIL FOOTS

By

F. C. Pack
Southern Regional Research Laboratory

Raw soapstock, as produced in the refining of cottonseed oil, contains numerous and varied substances. The major constituents are water, fatty acid soaps, and neutral oil (glycerides). Normally, these three materials in aggregate comprise well over seventy-five percent by weight of the raw soapstock. The minor components of soapstock, phosphatides, sterols, inositol esters, carbohydrates resins, pigments, and proteins---to list a few, though interesting individually and undoubtedly of value if isolated and purified, are present only in amounts that make their recovery, each or even severally, an economically dubious operation.

Furthermore, since unmarketed soapstock constitutes a disposal problem for the refinery, any proposal aimed at the recovery of some minor constituent of soapstock must be examined carefully lest the proposed recovery operation intensify current disposal problems.

Within the areas imposed by the foregoing considerations, the Oilseed Section of the Southern Utilization Research Branch has explored several avenues of investigation with the purpose of increasing the utilization of cottonseed oil soapstocks.

Among the more promising leads is the preparation of the benzyl, mono and dimethyl benzyl esters of cottonseed oil fatty acids by the direct reaction of dehydrated (but otherwise untreated) soapstock and the appropriate benzyl halide. Certain of these crude esters have demonstrated possibilities as secondary plasticizers.

Another avenue is the use of raw soapstock to alleviate dust problems in the preparation of mixed and pelleted feeds. For this particular purpose, a rapid and cheap method for reducing the gossypol content of raw soapstock is required.

The destruction of gossypol in raw soapstock is surprisingly difficult. Pure gossypol in an alkaline medium oxidizes readily in air. It was inferred then, that air-blowing plus mild heating would suffice to destroy gossypol in soapstock. Due, no doubt, to associated protective substances, the gossypol in soapstock stubbornly resists air-blowing and prolonged heating at 100°C. The thorough incorporation of relatively large amounts (5% by weight) of iron salts will inactivate the gossypol in soapstock significantly. However, this is predictably a difficult commercial operation.

A continuous, high temperature (200°C.) heat treating apparatus constructed as a joint effort of the Oilseed and Engineering Sections and currently undergoing tests is expected, on the basis of laboratory experiments, to solve the problem of gossypol destruction in soapstock.

Acidulated soapstock, currently employed on a limited scale for similar purposes requires the acidification process, a step that involves considerable time, large quantities of mineral acid and inherently expensive equipment.

DISCUSSION

Newby: Is it correct to say that it is necessary to carry out the reaction in the absence of water?

Pack: I am not sure of that. Gomberg and his students reported that they had prepared benzyl esters, not of these particular acids, but of benzoic, for example, in the presence of water. The reason it may be possible is that benzyl chloride isn't as reactive in water as you might think. It is much handier as far as we are concerned to carry it out on the anhydrous soapstock.

Newby: How expensive is benzyl chloride, and what are the sources?

Pack: I believe the current market price is about 22¢ a pound, and that it is made by the chlorination of toluene.

ACETOGLYCERIDES - NEW FATS FOR FOOD USES

By

Audrey Gros
Southern Regional Research Laboratory

New fat and oil products having unique and potentially valuable properties can be produced by substituting acetic acid for a portion of the fatty acids normally combined in the glycerides of fats and oils. These products may be referred to as "acetoglycerides". Acetic acid is not considered a fat-forming acid normally. The n-aliphatic acids having 4 to 22 carbon atoms are called fat-forming acids.

Within the last few years two groups of investigators, working independently, have developed practically all of the information on these interesting compounds.

The object of this report is to review the preparation and properties of these new fats, mention their status as edible products and indicate some promising uses.

The preparation of the acetoglycerides is accomplished by either of two simple procedures. In one, the triglyceride is reacted with triacetin in the presence of a catalyst. In the other, hard fat or oil is converted into a monoglyceride which is acetylated with acetic anhydride. The acetoglycerides may be "tailored" for a specific use by varying the amount of acetylating agent and the grade of monoglyceride.

Modification of a brittle hard fat produces an "acetostearin" - a relatively non-greasy yet flexible fat. Acetylation of a liquid oil, such as cottonseed oil, produces an "aceto-olein" - an oil which remains liquid at low temperatures, as in frozen food lockers.

After preliminary purifications, the products, like most edible fats and oils, must be rendered bland in odor and taste. This can be accomplished by standard alkali refining, bleaching and steam deodorization.

The acetoglycerides owe their unique properties to their peculiar crystal habits. Fatty acids, glycerides and many other substances exhibit polymorphism - the ability to exist in more than one form. By analogy,

carbon occurs in several crystalline forms - diamond and graphite, as well as charcoal, lampblack and boneblack.

The acetoglycerides are true fats. They possess crystalline structure as do ordinary fats but differ from ordinary fats in that some of the forms are waxy and translucent.

Upon rapid cooling tristearin solidifies in the alpha polymorphic form which reverts to the thermodynamically stable beta form. Both forms are opaque, hard and brittle. Ordinary cooling of melted 1,2-diaceto-3-stearin produces the alpha form, which is exceptionally stable; and most important, extremely waxy. The waxy form of the acetostearins have many potential uses.

Photomicrographical examination of crystals of tristearin and acetostearins reveals that the tristearin crystals are block-like while the acetostearin crystals are ribbon-like. Undoubtedly the interlocking of the soft, ribbon-like crystals contributes to the potential usefulness of these compounds.

The ability of the acetostearin products to function as soft coating materials has been measured to some extent by stretching test strips. At room temperature ordinary hard fats can be stretched only about 2% of their original lengths. Most acetostearins can be stretched to more than 8 times their original lengths.

Since films of acetostearins possess stretchability and flexibility over fairly wide temperature ranges, they are potentially useful as coatings. For such use the permeability to moisture and gases is important. The permeability to moisture of acetostearins have been found to be less than cellulose acetate, slightly more than polyethylene, polystyrene, paraffin wax and cellophane and about the same as ethyl cellulose, nylon and soft vulcanized rubber. Permeability to the gases carbon dioxide, oxygen and nitrogen are less than to water vapor. Thus, the acetostearins are suitable as coatings where an absolute barrier to moisture and gases is not required.

The "aceto-oleins" possess large amounts of plasticity at low temperatures and good resistance to oxidation and polymerization. Thus, they fulfill the need for an oil possessing low melting point and good stability. In contact with water, hydrolysis occurs as with natural oils. The oxidative stability of acetostearins at elevated temperatures is exceptional.

There appears to be no reason why the acetoglycerides should not be approved for food use. While glycerides containing acetic acid do not occur naturally, acetic acid esters do. No deleterious effects were evident in rats fed triacetin in the amount of 55% of the diet. Acetoglycerides cannot be recommended for food use until absolute proof of edibility has been established in thorough and extensive tests by qualified pharmacologists and nutritionists.

The higher-melting acetostearins might be used as protective coatings for processed meats, eviscerated poultry, dried fruit, cheese, ice cream bars, candies and baked goods.

The lower-melting acetostearins are useful as low-melting fats of extraordinary resistance to oxidation and rancidity. They may be used as slab dressings in the manufacture of candy and as a roasting oil for nuts.

The aceto-oleins are valuable as major ingredients in food products. One of these is a special margarine-like spread for the armed forces which has a long plastic range and will be acceptable after storage for six months at 100°F. The aceto-oleins may be used with hard fats to make blended-type shortenings superior to present shortenings with respect to heat resistance, baking performance, workability, creaming volume and foam formation.

There is interest in the use of the acetoglycerides in cosmetics and as a plasticizer for certain polymers or plastics.

In summary, the preparation and properties of some unique fat and oil products obtained by substituting acetic acid for some of the fatty acids ordinarily combined in fats and oils have been described.

By proper choice of starting materials and degree of acetylation these acetoglycerides can be tailored to possess specific properties.

For potential food uses the acetoglycerides may be divided into three classes: (1) nongreasy, plastic fats of relatively sharp melting points for protective coatings, (2) low-melting fats having extraordinary resistance to rancidity, and (3) low-melting oils which possess good stability and remain liquid or plastic at temperatures far below freezing.

A number of uses have been described.

DISCUSSION

Newby: How soluble are the acetostearins in the natural oils?

Miss Gros: Not completely, but very soluble.

Newby: Would you say that they are quite soluble?

Miss Gros: Yes; however, we do not have a complete investigation on the solubility.

Norris: How does the smoke point of your acetostearin compare with that of other oils?

Miss Gros: The smoke points of the acetostearins are lower than those of oils. To illustrate, aceto-olein products can be used with hard fats to make blended-type shortenings. Normally shortenings have smoke points around 400°F.; these shortenings have smoke points of 300°F. This is the only exception to comparable or superior performance. Shortenings with added aceto-olein have been shown to be superior to usual commercial shortenings with respect to heat resistance, baking performance, workability, creaming volume and foam formation.

FREE GOSSYPOL AND PROTEIN SOLUBILITY

By

Mack F. Stansbury
Southern Regional Research Laboratory

In the various reports on the progress of research on improving the nutritive value and utility of cottonseed meal, constant reference has been made to two analytical methods. One is for the determination of free gossypol and is used as a measure of the completeness of the binding or inactivation of gossypol during processing of the seed. The other is for the determination of solubility of nitrogen or protein. It is an empirical measure of the availability of the nitrogen on digestion by chicks, under the conditions of the nutritive tests. The reliability of the results obtained by the use of these methods depends on uniform application of the techniques involved by all laboratories using them. This becomes a most important consideration as more laboratories become involved and it is necessary to compare results. As in the case of most analytical methods, they are not considered perfect and are subject to improvement as further research on them is done.

The method for determining free gossypol is based on research conducted at the Southern Regional Research Laboratory and has been adopted as official by the American Oil Chemists' Society. It is not applicable to chemically treated cottonseed meals containing dianilino-gossypol. However, recent research at the Southern Laboratory has indicated that a modification of the present procedure will make it applicable to the analysis of such meals. It is now being studied collaboratively with the expectation that the A. O. C. S. official method will be revised to provide for the analysis of such chemically treated meals. Attention is also being given to improving the precision of the present method in the analysis of meals having very low free-gossypol contents.

The precision of analysis of 184 conventional cottonseed meals for free gossypol at the Southern Laboratory resulted in standard deviations ranging from 0.0005 to 0.0017 for the five ranges in gossypol content. This means that two-thirds of the time, the differences between duplicate results were within plus or minus these amounts from the mean gossypol content of the duplicates. The coefficient of variation expresses the standard deviation as a percentage of the mean and provides a means of comparing precision on a common basis. It is noted that the precision increases somewhat as the amount of free gossypol increases.

The results of check sample testing by the Smalley Committee of the A. O. C. S. give a somewhat different picture. The free gossypol analyses on 4 samples by 13 chemists show wider deviations, but are encouraging when one considers it represents the first comparison of the level of test between laboratories. In this connection it is well to bear in mind that the errors of calorimetric analyses are multiplied as a result of the small aliquot usually taken for final evaluation.

The method currently used in the cottonseed research for determining nitrogen or protein solubility was developed by Dr. C. M. Lyman and his associates at Texas A. & M. College. It uses 0.02 N alkali for extracting the protein under specific conditions. Hence, this method is empirical and the procedure must be followed exactly to obtain comparable results by and between laboratories. (A summary of the analysis of 4 check samples by 16 laboratories were shown.) In addition to normal deviations between results obtained by different laboratories, the deviations in the present data are in part attributed to lack of facilities in some of the laboratories to permit following the prescribed procedures exactly. Another set of check samples have been distributed to the same laboratories for analysis. With emphasis on maintenance of level of test it is expected that the results of analysis for nitrogen solubility by different laboratories will be found in much better agreement. However, it is expected that the values reported will be reliable only to within about ±2 percentage units.

(The free gossypol contents and nitrogen solubilities of 5 types of cottonseed meals were summarized.) Without reviewing the processing methods the results reflect in general the conditions imposed on the meats during processing. Those imposed by low-temperature screw-pressing and by the prepress solvent extraction appear to contribute on the average to the production of meals containing low levels of free gossypol and having high nitrogen solubilities.

DISCUSSION

Miller: What low-temperature screw-press meals were those that you were discussing?

Stansbury: These were meals prepared by Dr. Thurber and his associates. Any processing information desired could probably be obtained from Dr. Thurber.

Norris: Can you explain why the coefficient of variation of free gossypol in the Smalley Committee cottonseed meals was about 10% as compared to the approximately 4% coefficient of variation value for the samples in your Table I?

Stansbury: The data in Table I were obtained in the Analytical Unit of this Laboratory, whereas the Smalley Committee data were obtained by analyses at 13 different laboratories. When numerous laboratories are involved larger coefficients of variation would be expected. Part of the difficulty may be due to the fact that some of the analysts are not following details of the analytical procedures closely enough.

Norris: Can you give some idea of the duplicability of results usually obtained relative to protein solubility?

Stansbury: In our experience at this Laboratory we find that results on a given sample usually check within one or one and one-half units of protein solubility. As more laboratories become involved the variation can be expected to be somewhat larger than this.

GENERAL DISCUSSION AT THE CLOSE OF THE MORNING SESSION

Smith: I am still interested in the residual oil of the low-temperature high solubility protein meal.

Dunning: One of the mills currently processing by this method is getting 77% of the protein out by analysis. However, that mill is producing a cake containing 5% oil. I can say that in all cases you have to get up to 4 or 5% oil to get high protein. There is evidence that to get the high of 77% soluble protein is not compatible with getting good oil, low residual lipids, high equipment capacity and so on.

Smith: Right now it looks as if you have to sacrifice on one end or the other.

Gastrock: I would like to offer two sentences along that subject. You will recall that a few years ago we had contract research work done on screw-pressing by Cecil Wamble at Texas A. & M., and one of the important conclusions of this work was that it was not possible to get high crude throughput and high yield of oil without pouring the power to the screw-press. The corrolary of that is that high power input is what usually, practically without exception, involves higher temperature.

Verdery: Has any work been done to see if there is any variation between cottonseed in respect to protein solubility as there is in respect to gossypol?

Gastrock: As far as I know there is nothing in the seed that effects the solubility, except what might happen in the form of protein damage as a result of field damage to the seed, or the storage of the seed.

French: We do not necessarily have to say that high power influence and low oil mean poor protein solubility. A lot of mills are getting worse protein solubility because they are running higher extractions. Cooling probably has more to do with protein solubility than any other factor.

Dollear: Do Mr. Verdery's oil color findings represent a trend which should affect our future program along the lines of our thinking?

Verdery: I think it is a trend because everybody is picking up a little here and there, and everybody is naturally improving. Just what affect it might have on your program here, I do not know but certainly we cannot ignore all the information we have. However, I do not think you ought to relax any efforts to make it still better.

Newby: I would like to say that the program on the color of oil should be intensified if anything. It is true that I think the color of oil is improved quite a bit but we should not drop off in our program even if some mills produce better oils for a while.

Woodruff: Does the use of acidulated soapstock in meal hold any particular problem in reference to the elevation of the gossypol contents in the meal?

Wallace: It happened with us.

Dollear: As long as a very small amount of acidulated soapstock is used the gossypol content might not do as much harm. If you are trying to use it as a source of fat, enough to contribute additional fat content to the meal there might be an effect. Whether in practical experience

this would occur I don't know. As I understand there has not been too much cottonseed acidulated soapstock going into feeds as yet.

Bryson: Twenty % tests, 36% tests, and 41% tests have been made. This year our gossypol averaged somewhere around .02%. Our pellet business is increasing and our meal is going more to the mixers for hog tests and to the chicken industry.

Verdery: Are you putting soapstock in both the meal and the pellets?

Wallace: Yes Sir.

Verdery: How much are you putting?

Wallace: About 1 or 1-1/2%. You should put 1-1/2%.

Woodruff: There must be something in that soapstock to give it an appetite because they will pick up a pellet containing soapstock in preference to any other.

Mays: If the seed could be crushed in early fall a light colored oil would be obtained. However, there are many instances when seed is carried over until the next summer. Prolonged storage results in dark colored oil. That seems to be one problem that will always exist.

NEW APPROACH IN THE CLEANING OF COTTONSEED

By

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A new approach is described for the cleaning of cottonseed wherein the seed and its contaminants, moving at high speed, are projected into still air, and subjected to the combined effects of air drag and gravitation. The spectrum-like floor pattern obtained shows encouraging possibilities for separation by fractionation methods of not only foreign matter from seed, but also fractionation of the seed in accordance with meats contents, oil content, oil quality, linters content, and possibly length of linters. A high degree of purity in any particular fraction can be achieved using recycling techniques.

Results of three series of exploratory experiments are presented. In the first series, individual particles of seed and trash were used. In the second series several particles of different types were used, and in the third series, handful quantities of mixtures of seed and foreign matter were used.

In the first series, two tests were conducted. In the first test 10 particles of each type seed and foreign matter was projected, and in the second test 25 particles were used.

In the second series, one test was made in which several particles of different types were projected at the same time. In the third series two objectives were explored: The first objective was to determine the effectiveness of the method using cottonseed from both upstream and downstream of the first cut delintering machine; the second objective was to determine the effect of increasing quantities of foreign material on the distribution of foreign material in the various fractions. The usual analytical tests for quality were carried out on samples of seed from the various fractions obtained in both the initial and recycle projections.

Results of recycle tests were not presented because the slingshot type devices used in these projections were crudely designed and did not fully carry out the requirements of the new approach in the initial projections. In addition, all exploratory tests designed to evaluate the new approach have not been carried out.

Conclusions: The exploratory tests indicate that, in general, as distance from the casting device increases the following was observed:

(a) The cottonseed quality improves.

(b) The quantity of linters on the cottonseed increase to a rather definite amount then decrease.

(c) Trash content or foreign matter increases up to a certain point, then decreases.

The concept thus far promises a method of fractionating cottonseed and its contaminants in such a manner that the following separations may be effected:

(1) Foreign matter from cottonseed.
(2) Cottonseed in accordance with their meats content.
(3) Cottonseed in accordance with their oil content.
(4) Cottonseed in accordance with their oil quality.
(5) Cottonseed in accordance with their linters content.
(6) Cottonseed in accordance with their linters length.

Possible Advantages of New Approach: Assuming that projections on a continuous type unit would give results equal to or better than the hand-full-scale unit, it may also be possible to make not only separation of seed and foreign matter, but also separations of seed in accordance with their linters content and to continuously convey them to either first-cut, second-cut, or to third-cut delintering machines or to hullers as may be required. Thus, greater uniformity in staple length of linters may be effected.

Seed of inferior quality such as empty or immature seed would probably be collected with the foreign matter.

If practiced prior to storage, removal of appreciable quantities of foreign matter and very low quality cottonseed, particularly the decayed seed, should contribute towards a reduction in the rate of deterioration of large quantities of seed during storage.

Future Trends in Work: A device for carrying out the requirements of the theory on a continuous pilot plant scale has been designed and is now being fabricated. Tests using this unit will start in the near future.

DISCUSSION

Smith: How much space would the apparatus require?

Gastrock: A one pass treatment might be performed in a space about 6 or 8 feet wide by 75 feet long.

Smith: Will the second pass be along side like an escalator going up and down?

Gastrock: Yes.

Witz: How do you plan to throw the seed continuously?

Gastrock: We have a double belt arrangement which we are planning to try out- it will take a layer approximately 1 particle thick on one

belt as dispersed as possible and held down with another belt on top. You can thus avoid the bouncing effect which was one of the difficulties we had on our first belt affair.

Jones: Were there any sticks 2 inches long in the 82% fraction that was projected for 38 feet?

Holzenthal: There would be a small quantity of short ones.

Jones: You showed about a half of 1%.

Holzenthal: In some cases, it depends just where you make your cut. It is more or less a trailing out effect. Starting at the projector, free linters and maybe some lint cotton is obtained. Then forward of this you get very fine field trash, that grades progressively into larger particles intermediate in size, then sticks will fall out starting with small sticks and going all the way up to the largest sticks. For example, if you have a stick in there about 5" long as big around as a pencil-obviously that will travel a little further. If anyone would like to see photographs of samples taken from the fractions at various distances from the projector they are on this table. A description of each picture is also provided. A photograph of the floor pattern produced by projecting 100% trash is also here.

Smith: I am particularly interested in the removing of cockleburs.

Holzenthal: The cockleburs definitely fall in the first 38 ft. The sand, loose linters and lint are up close to the projector. The lint might be aspirated off somehow and recovered. We can get the dust out of linters but there are two other steps before this that we want to experiment with in order that it will be alright.

Verdery: What do you mean by tension?

Holzenthal: How much we put back on the sling shot - within a range; between the minimum distance at which separation of the various fractions start and a maximum to which we pulled back on the particular device that we built.

PRESERVATION OF COTTONSEED AT OIL MILLS BY REFRIGERATION

By

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Installations such as Muskogee seed houses and "silo-type" metal tanks, both equipped with atmospheric air cooling systems, represent the sum of improvements to date resulting from efforts over the years to provide facilities that will reduce the deterioration incident to holding cottonseed prior to use.

While oil mill operators have established definite rules for safe housing of cottonseed, the annual losses due to deterioration of cottonseed have been stated to be still as high as $1.00 per ton of seed, or about $5,000,000 per year for the average crop.

The purpose of this presentation is to show the possibilities of use of mechanical refrigeration in the cooling of cottonseed, from the aspects

of reducing seed loss from deterioration and corresponding financial gain.

The deterioration of cottonseed is caused largely by biological processes. In its respiration, the seed generates heat, yet, because of the insulating properties of the lint, cannot dissipate this heat quickly. High temperatures, high moisture contents, and presence of some damaged seed - all these promote seed deterioration. Local "hot spots" are generated in the masses of seed, the localized heat is not dissipated, and the seed in these "spots" rapidly deteriorate, with oil and other components of the seed breaking down. This breakdown is usually measured by an increase in the F.F.A. content of the seed.

Freyer (1) and others have published data on the effect of moisture, temperature, and length of holding period upon the free fatty acid rise in stored prime seed. These curves show clearly the benefits of reducing temperature and moisture content. Presence of damaged seed or of seed with high initial F.F.A. content causes even greater rises in F.F.A. than the extent indicated by the curves. Various means have been tried to prevent this free fatty acid rise, but the only means known to be successful to any degree is to reduce temperature and moisture content. Experimental work by Stansbury and Guthrie (2) of this Laboratory showed that seed at 32° F. and 8-9% moisture could be kept for more than a year with negligible change in F.F.A. and other significant characteristics.

Circulation of mechanically refrigerated air through the seed would effect a low temperature long before circulation of athmospheric air would, due to prevailing ambient temperatures. The circulation of conditioned air also presents the possibility of adjusting the moisture content of the seed to optimum values.

Preliminary calculations indicate that it may be practical to cool the seed to about 45° F. with mechanical refrigeration. This can be done as early as August and maintained throughout the season. Advent of low atmos-pheric temperatures in December and January will cause the requirement of maintenance refrigeration during that period to be negligible.

The example mill, upon which the calculation was based, processes 100 tons per day for ten months, in an area about midway between Memphis and Jackson, Mississippi. The mill has four standard metal "silo-type" tanks, each of 4000 ton capacity.

The maximum amount of seed deposited in any one month is about 13,500 tons which is the reason for using four mill tanks. In this calculation the first tank is filled by September 25; the second by October 25; the third by November 30; and the fourth by December 31. This rate of storage along with the 10% per month rate of processing extends the crushing season beyond that for the average hydraulic and screw press mill.

The trend since 1946 toward larger mills - accentuated with the adoption of solvent extraction - has extended mill operating seasons into June and even July. Such a trend emphasizes more strongly the need for facilities not only to hold but to preserve adequately large quantities of cottonseed.

The relative positions of the average maximum and average minimum temperatures for each month above or below the 45° F. temperature line clearly show the impossibility of cooling with atmospheric air until December, or of maintaining uniform 45°F. holding temperature after

February with atmospheric air cooling.

The data were basic for calculating the refrigeration load for the particular example mill - 3163 total ton-days with a 25-ton refrigeration system. Of the 3163 ton-days, 1130 are for initial cooling and 2033 for maintenance.

Assumptions made in the calculations include: (1) The tanks were aluminum painted, with no external insulation, and an estimated thermal conductance value of 0.05 B.T.U./hr./sq.ft./°F. for the outer 12" annulus of cottonseed mass. (2) Cooling was maintained at rate of seed receipts, and was started for each tank when the first seed enters the particular tank. (3) For initial cooling, the average maximum temperature for the month was used, and for maintenance the average monthly temperature was used.

The 25-ton unit capacity is determined by the maximum average tonnage required of those calculated for all periods. Actually, if this unit operates continuously, 8350 ton-days would be available on a full-load basis compared to the total 3163 cooling requirement. In the example case, periods of 56, 29, 37, and 31 days are shown as scheduled for filling tanks 1, 2, 3, and 4 in succession and 59, 41, 40, and 41 days for emptying the filled tanks in the same order. In those same periods, ton-day requirements for initial cooling plus maintenance cooling amounts to 765, 590, 501, 238, 353, 278, 257, and 181 in order, to total 3163 ton-days.

The circulating air that will directly cool the seed will be cooled by the refrigerating unit to 41-43°F., and could be sent up an air riser located near the tank center, and then flow downward through the surrounding seed mass. A cooling coil (evaporator) and fan system would be installed for each tank. A common compressor and condenser would supply refrigerant to all or any of the cooling coils.

Presently used air-cooling arrangements (without refrigeration) utilize a 60-75 H.P. motor pulling 15,000-20,000 C.F.M. through each tank. Pressure drop through seed mass heights of 60 feet amount to 15-25 inches of water for this range of air flow. With refrigerated air, however, it is felt that air flows as low as 7000 C.F.M.; with a H.P. requirement possibly as low as 20, may be adequate.

Operating hours, on the other hand which are estimated to be about 1000 hours per season in present practice, may be increased to about 3000 hours in refrigerated air cooling. In electrical cost for fan operation the H.P.-hour product is not expected to change in the conversion.

A summary of estimated power costs per ton of cottonseed held is shown in the following table:

Power Costs - Cents per ton

Initial cooling	2.62
Maintenance cooling	4.72
Air circulation	16.45
Total	23.79
Present air cooling	16.45
Difference	7.34

In the over all economic picture, the total installed cost of the new system in the example mill is estimated at $30,000.

Fixed costs for the season are estimated as $4050., operating costs $2310.(Mechanical operation assumed by existing personnel.) Assuming a gain of $0.75 per ton of seed held, or $12,000. total for four tankfuls, will afford a net gain after taxes of $2810., or about 17-1/2 cents per ton deposited. Payout time on this basis would be 6.1 years.

Possible further benefits that may accrue from conversion to refrigeration cooling may include: (1) Availability of supply of well preserved cottonseed adjusted to a more satisfactory moisture content. (2) Improved lintering, hulling, flaking, and cooking operations. (3) Decreased loss of oil and meal values in linters and hulls. (4) Improved gossypol reductions and oil color. (5) Less deterioration of seed due to insect infestations.

This presentation is made with full realization of the preliminary nature of the work and of the assumptions and estimates on which the calculations are based. The authors hope that this information has proved interesting and stimulating, and critical comments would be appreciated.

References: 1. Freyer, E., Oil and Soap, 11, 162-64, 176 (1934).
2. Stansbury, M. F., Guthrie, J. D., Journal of Agricultural Research, 75, (No. 2), 49-61 (July 15, 1947).

DISCUSSION

Verdery: Do you feel that there is appreciable saving by going down as low as 45°F on seed, you might say about 8% moisture.

Vix: The information presented shows that there is some rise in F.F.A. upon storage at 60°F, for 90-120 days, even when the seed has a moisture content as low as 8-10%. It is true that the rise is only about 1/2-3/4%, but probably lowering the storage temperature to 45-50°F, would further reduce the rise to about 1/4%.

Verdery: What I was driving at is do you have facts there that would prove that you still have an appreciable rise in acid on the low moisture seed at 50 or 60°F.

Vix:: In some areas where the seed is very dry, (6-7%) I do not think the rise would be appreciable for storage at 50-60°F.

Verdery: Would it pay to do something about it?

Vix: I think in your area you can probably see the advantage. If the moisture content could be slightly raised in any way, all the advantages that I mentioned in the end would be credited to your operation. Such an installation might prove a saving and also reduce financial losses due to deterioration in areas where there is contamination due to moisture content of the air and damaged seed and oil.

Newby: Your calculations show that 25 tons of refrigeration would be enough for three full tanks. Is that what you calculate it to be?

Vix: On the basis of the calculation approximately a little over three tanks.

Newby: When you cool the air, what is done about the increase in relative humidity of the air from cooling? Do you dry it also?

Vix: You get a certain amount of latent and central exchange in bringing your temperature down, and the air coming from the tank will probably be almost saturated and at a high temperature. In bringing the air through the cooling coil you would dehumidify it.

Newby: Would you condense the water?

Vix: That depends upon the temperature of the tank in the storage, the temperature of the seed in the storage, and the temperature of the prevailing outside air.

Newby: We tried that, not identically like you outlined there, about four or five years ago on a tank holding 20 tons of cottonseed and even with a good deal more refrigeration we weren't able to make it work at all. We found we could get a thin layer on top very cold, but we couldn't get the rest of it cold. Regardless of how many hours of refrigeration were used, hot spots were developed which heated up faster than they could be cooled.

Smith: I would like to know if the proposed plan is to set your refrigerating unit up outside, or in another building separately, to tie in with the present system that you already have for forcing air through the tube.

Gastrock: The idea would be to add refrigerating facilities to the present, or somewhat modify the present air circulation system.

NEW OIL CROPS FOR THE SOUTH

By

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Introduction

This paper is a current review of potential new crops for the South. What has been done and what is being done by agronomic and utilization research groups to assist in the bringing about of the commercial production of these commodities, as well as the need for and challenge to continued research is outlined. The need to utilize idle cropland, to supply more protein, to enrich agriculture with new industrial oils from the soil, and to decrease our dependence on imported oils is discussed. This report is being given at a time that a new agricultural program is being advanced to assist farmers in meeting the problem of diverted acres as an encouragement to sound land use patterns and at a time that the growing population trend indicates that in the next two decades we must, in effect add somewhere between 100 and 165 million acres of cropland or its equivalent to the farm plant.

Need for the Work

In 1949, the year of the last published agriculture census, in the Southern Region alone, cropland not harvested and not pastured

amounted to more than 14,600,000 acres or 61.4% of the total cropland. This figure includes idle cropland, land in soil improvement crops only, land on which all crops failed and land seeded to crops for harvest after 1949 (on which no crop was harvested in 1949). In 1944, idle or fallow cropland in the Southern Region amounted to 11,500,000 acres. The recent restrictions on cotton acreage have increased the need for commodities essential to the operation of existing oil mills. More protein is needed. This need can be no better expressed than by Undersecretary of Agriculture True D. Morse, who said that Americans do not eat enough high protein food; that livestock and poultry rations, taken as a whole, do not contain enough protein; and that even through we are producing increasing amounts of protein feeds, all of them are used.

New oil crops are needed to decrease our dependence on imported oils, such as castor and coconut oils. Imports of fats and oils and oil-bearing materials have been equivalent to about a billion pounds of fat a year.

There is a need for new industrial oils from the soil which will enrich agriculture, raise our standard of living, and strengthen our defense. In 1953, farm income was more than 20 percent below the high of 1947. During the past few years domestic disappearance of fats and oils in industrial uses has declined. The major decline in industrial uses occurred in the manufacture of soap, where synthetic detergents based chiefly on petroleum derivatives displaced nearly half-a-billion pounds of fat in the past three years and now account for more than half of the total U. S. market for detergents.

The New Crops, Their Development, Production, Processing, Marketing and Uses

In this paper, "New Oil Crops for the South" are those crops which had not been produced commercially in the Southern Region until recent times. They are in contrast to such oil-timers as King Cotton, corn, peanuts and rice. The Southern Region includes the Carolinas, Georgia, Florida, Tennessee, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas.

The new crops are classified according to extent of development for commercial production.

Class I: New crops which are being successfully produced commercially in any one area of the Southern Region. In this class are soybeans, tung, grain sorghum, castor, flaxseed, and okraseed.

Class II: New crops which are being developed and show promise but which have not been produced commercially in any one area of the Southern Region. This class includes sesame, safflower and stillingia (or the Chinese tallow tree).

Class III: New crops which are in an early stage of development and which are not ready to be evaluated for commercial production in the Southern Region at this time. Perilla seems best placed in this class.

Class IV: New Crops which have been grown in the Southern Region in small quantities and which do not fall into Classes I, II, and III. They have been reported statistically and are only potential. Included are rapeseed, sunflower, tobacco seed, cucurbits, acorns, and jojoba. The above classifications are based on data obtained from the state experiment stations, the industry, and the literature.

Castor Beans:

A commodity of particular interest in the South today is the castor bean. As a result of experimental tests to develop new oilseed crops for the Texas blacklands, the castor bean plant was tried and found acceptable. It is commercially grown in Texas, Oklahoma and Arkansas.

Recent reports indicate that the acreage planted to castor beans this year is the lowest since the Government inaugurated a program in 1951 to encourage domestic production. The reduction in plantings took place in most states growing the beans and apparently primarily reflects the reduction in the Government's guaranteed minimum price and other changes in the Government's program.

Because of the restricted acreage on cotton and because castor beans and cotton have much the same growing season, there has been considerable interest shown in castor beans in the Southeast, particularly during the past year.

In order to be a successful money crop for farmers, a castor plant must be grown which produces beans and stalks in proper proportions and of the right type to permit commercial development of the crop for both oils and cellulose.

Mechanization in production, harvesting and processing will be necessary for economical production in this country.

The medicinal use of castor oil is relatively minor. The oil is actually used mainly as the raw material in the manufacture of many materials needed for civilian and military uses, including many products in everyday use. Important military uses are for the lubrication of jet airplane engines, all-purpose greases, hydraulic and gun recoil fluids, low-temperature waterproof coatings and plastic coatings for electrical equipment. It is also used as a plasticizer in the manufacture of fabrics and explosives. Other uses are in the manufacture of artificial leather, soap, cosmetics, printing ink and special low-temperature lubricants and flexible coatings. The largest single consumer is the protective-coating industry in which, after dehydration, castor oil is used as a quick-drying base for paints, lacquers and varnishes. Many non-yellowing enamels are based on dehydrated castor oils. Castor oil is the chief raw material for the production of sebacic acid which is the basic ingredient in the synthesis of nylon plastic. This nylon type plastic is used for brush bristles and for jacketing of field wire used by the military. An older use of sebacic acid is as an intermediate in the preparation of monomeric esters which are useful as plasticizers. It is important in the production of other plastic products because it makes the material moldable at lower temperatures and later keeps them from becoming hard or brittle. Sebacic acid polyesters are valuable in steam-sealing and in caulking compounds used to prevent leaks in aircraft gasoline tanks because of their high gasoline resistance.

Sesame:

A crop that now holds promise of becoming a new source of cash income for the South is sesame. In 1953 about half a million pounds of the shattering type were produced in Texas and about a third of this was crushed for oil. With the development of non-shattering types, the commercial aspects of sesame have taken a sharp upturn in recent years. As a part of a broad research program being carried on by U. S. Department of Agriculture, and state experiment stations in cooperation with the National Cottonseed

Products Association Educational Service, research workers are pushing toward the goal of making nonshattering sesame available for farm production. Leaders in this research are J. A. Martin, Clemson College, S. C., and Dr. M. L. Kinman, Texas A. and M. College.

The experience of a number of oil processing mills in the United States indicates that existing crushing facilities can be used for processing sesame without any extensive modifications. In the United States, some sesame seed is used in several types of confections and candies, but the principal market for the whole seed is in the baking industry as a topping for bread and rolls. Sesame oil is used as a salad or cooking oil, in shortening, margarine and in the manufacture of soap. Minor uses are as a fixative in the perfume industry and formerly as a carrier for fat-soluble substances in pharmaceuticals such as penicillin. One of the minor constituents of sesame oil, sesamin, is used for its synergistic effect in pyrethrin insecticides; the addition of a small quantity of this substance markedly increases the effectiveness of fly sprays.

Sesame oilseed meal is a rich source of protein, calcium, phosphorous and of the vitamin niacin.

Soybeans:

Soybeans is now a major oil crop of the South. Chief producing regions are the Mississippi Delta and the Atlantic Coast regions. In 1952, more than 33,000,000 bushels were produced, with Arkansas the chief producer supplying nearly 14,000,000 bushels.

Soybean production has increased significantly in the South in recent years partly as a result of limitations on cotton acreage. This expansion can be expected to continue if production controls remain in effect for cotton, tobacco and peanuts, and unless future developments necessitate production controls on soybeans.

Grain Sorghum:

Grain sorghum is a new commercial crop of the South. In 1952, 48,000,000 bushels were grown in Texas, 4,248,000 bushels in Oklahoma, and 1,161,000 bushels in North Carolina. Sorghum is better adapted to hot, semi-arid climates than corn, its chief competitor in the production of feed grains. It generally outyields corn in areas where the rainfall is less than 30 inches and in areas where the soil is too shallow to retain sufficient moisture for a good corn crop. Grain sorghum has slightly more, but no better quality protein than corn, and it is slightly lower than corn in energy value. The grains are processed by wet milling, oil and animal feeds being among the products. The oil, which is pressed from the germ, makes up about 2 percent of the grain. A manufacturer reported that all of the oil which they produce is packaged in small containers and is sold on the export market, principally in the Caribbean region, and it disappears in the retail market. They have found little market for the refined oil in the United States because it is offered in such small volume and because it will not pass the 24 hour winter test. Gluten meals, available as feed for farm animals, compare favorably in crude protein content with commonly used protein supplements. These feeds would contribute materially to the total protein content of the ration, but the quality of such protein leaves much to be desired. Final recommendations depend on the type of animal to be fed and the other constitutents of the ration.

Stillingia:

Another new oil crop of the South is the Chinese tallow tree (Stillingia) which is a source of both tallow and oil. The seed from the tree contains about 24% tallow and 20% oil. The oil is the most valuable, as it is superior to linseed oil as a drying oil, and is as good as tung oil in several applications. The tallow has been used as a cloth dressing by the industry for a long time, and of course, it is now naturalized to Florida, Louisiana, and Texas. It grows exceptionally well in Southwestern Texas and as far up as Austin. It can be grown on wasteland. The seed germinate readily, small seedlings are readily transplanted, and it has no known insect enemies.

Okraseed:

A crop that will grow throughout the South, and farther north than cotton is okra. The Louisiana Agricultural Experiment Station has for years been breeding new varieties of okra and has developed varieties ideally suited to complete mechanization.

Only slight modification of equipment is necessary in the conventional cottonseed oil mill to process okra seed.

Other crops:

(1) Wild Gourds: The wild gourds of the Southwest drylands, in particular, the Buffalo Gourd produce a seed rich in oil and protein. Here at the Southern Laboratory a solvent extracted Buffalo Gourd oil was produced; dark in color and exceedingly resistant to bleaching; but which after refining, bleaching, and deodorization, was bland, had good stability and had no tendency to revert in flavor. It has been recently reported in the literature that Phytin, rich in organic phosphorous and used in the form of its calcium and magnesium salts as a nutrient in rickets, anemia, and tuberculosis, has been separated from protein flour from the extracted meals of three wild gourds and chinese tallow seed, already mentioned.

(2) Perilla: Up until now only small plantings of perilla have looked favorable. Breeding and selection work is being conducted by the Department of Agriculture at Beltsville.

(3) Coconut Palms: A considerable number of coconut palms grow in Southern Florida, from Palm Beach Southward. Although some of them appear to be native, the coconut was introduced there long ago, perhaps from the West Indies. The fresh nuts are consumed locally.

(4) Safflower: An advantage this crop has in West Texas is that it can be produced with wheat growing machinery and harvested with a combine. Good seed of the variety available in Texas contains about 22 percent oil. Safflower cake is suitable as a livestock feed and contains about 25 percent protein.

Utilization Research

General:

The above commodities are being developed as new oil crops for the South, but before they can be produced profitably on a commercial scale, and with due regard to their positions in the overall economy of agriculture, markets must be established through utilization research. Success in their development will depend largely upon the degree of cooperation between production and utilization groups. Indications are that the greatest

potentiality for market expansion for fats and fatty acids is as chemical raw materials for a variety of industries. Future expansion will depend greatly on the knowledge of the chemical and physical properties of fats and oils and their derivatives, with which oil chemists are concerned, and on the industrial applications that are developed.

Fatty Acids - Uses, Marketing and Commerce:

The saturated acids, particularly stearic (usually containing a large portion of palmitic), are useful in soap, nonsoap detergents, cosmetics, candles, and waxes. Oleic acid also is used extensively in soap and other detergents and in sulfonated-oil products. This does not mean that stearic and oleic are interchangeable, but that their qualities supplement each other in many products, as in soap. Oleic also is used extensively in cosmetics, and edible oleic is used in shortenings.

Unsaturated acids are unstable, will combine with each other (in polymerization) and with oxygen, and in these actions offer the "drying" characteristics necessary in the paint-oil market. Oleic lacks almost completely this trait of most unsaturated acids.

Because of the great commercial importance of rapeseed oil, erucic acid has received intensive study. It is not available commercially as a free acid. This acid on ozonalysis might give the C_{13} dibasic acid in high yield. Probably this acid would find relatively large markets at about 40¢ per pound as an intermediate for making resins, fibers, rubbers and plasticizers.

Eleostearic acid, the chief constituent of tung oil, has many special properties and outstanding characteristics which indicate expanded outlets.

Ricinoleic is the chief constituent of castor oil, uses of which have been mentioned.

Work at Southern Utilization Research Branch:

In conclusion, to meet the need for new industrial outlets for cottonseed oil and other vegetable oils now being produced in excess of current domestic and export demand, the Oilseed Section of the Southern Regional Research Laboratory is working on the development of procedures for converting cottonseed and peanut oils into intermediates (dibasic acids) for industrial use in polymeric resins and lubricants.

It is believed that shifting of the double bonds in oleic acid by partial, catalytic hydrogenation might point the way to making sebacic acid - a material now made from castor oil.

Because a by-product of the production of dibasic acids from positional isomers of oleic acid of the type produced would be short-chain, saturated fatty acids, this work might provide a method for making coconut oil substitutes from domestic oils.

In cooperation with the Plant Industry Station, Agricultural Research Service, the Engineering and Development Section of Southern Utilization Research Branch has rolled and pressed jojoba for oil, and hydrogenated some of the oil to produce the wax. Oil and wax samples were sent to the various industries for evaluation and use in research. Effort is underway to compare the processing of jojoba by the cold pressing and solvent extraction methods.

VALLEY OILSEED PROCESSORS' ASSOCIATION

PRESENTATIONS ON INDUSTRIAL PROCESSING PROBLEMS

REPORT ON PROGRESS IN REMOVAL OF STICKS FROM SEED COTTON AT GIN

By

A. L. Vandergriff
Lummus Cotton Gin Company

The problem of removing sticks and stems from seed cotton has baffled ginners and gin machinery manufacturers for years. As you well know, the increase in mechanical harvesting during and since the war has forced us all to devote our best efforts to solving this problem. We are glad to report that some real progress has been made recently by the gin manufacturers and the U.S.D.A. Research Groups.

Gin cleaning equipment which has been considered standard until very recently had a very low efficiency in removing sticks. The screening surfaces were generally 2 x 2 mesh wire screen which allowed only a small percentage of the sticks to pass through. The master and unit extractors depended on a toothed cylinder holding the cotton while a rotating stripper cylinder stripped back the foreign matter. The clearance between the surfaces of the two cylinders was normally 3/8" to 1/2" which is sufficient to allow a large percent of the sticks to pass through with the cotton. This resulted in a stick removing efficiency of 20 percent to 40 percent in an entire plant. Since sticks are a problem if they are present in the seed cotton entering the gin in quantities greater than 1 percent, it can be seen that a vast improvement was necessary to handle mechanically harvested cotton.

The first efforts in this direction were along the line of slotted openings as cleaning surfaces and many varieties of these appeared during and immediately following the war. Some good solid developments came out of these trials. However, the stick removing efficiency of the best of these machines was not enough to meet the maximum conditions of mechanical harvesting.

A study of the situation revealed that the percentage of sticks in spindle picked cotton ran usually not higher than 5 percent and that stripper harvested cotton in West Texas and Oklahoma contained generally 10 percent to 20 percent sticks. The spindle picked cotton contains a very low percentage of hulls, while in stripper cotton the hulls are a major problem. To design a machine or combination of machines that could meet the maximum conditions for both types of harvesting presented quite a problem.

For the spindle picked cotton, we have designed a set of cylinder cleaners in which the cleaning surfaces are grids formed by properly spacing 3/8" rods extending across the machine parallel to the axis of the cylinder. These rods form elongated passages for discharging the trash as the cotton is rubbed across them by the action of the spiked cleaning cylinders. A set of these cleaners consists of a 6-Cylinder Hot Air Cleaner and a 6-Cylinder Gravity Cleaner. The Hot Air Cleaner serves to separate the cotton from the drying air, the hot air being discharged through grid cleaning surface. In this machine the 3/8" rods are mounted on 11/16" centers, leaving a 5/16" elongated opening between the rods for the discharge of the trash and air.

The Hot Air Cleaner discharges the cotton into the Gravity Cleaner in which the same type of screening surface is used except that the 3/8" rods are on 7/8" centers leaving 1/2" slot between rods. This spacing allows a larger percentage of the foreign matter to be screened out along with a small amount of cotton. The machine is inclined and has a very efficient reclaimer attached to the bottom through which the foreign matter and small amount of cotton passes. The cotton is reclaimed from the foreign matter, cleaned and returned to the main stream by this unit.

These units have a very high efficiency on all types of foreign matter. Their efficiency on sticks runs about 30 percent on the Hot Air Cleaner and a minimum of 40 percent on the Gravity Cleaner. This gives us a combined efficiency of 58 percent. Assuming that a moderately equipped plant already has around 50 percent to 60 percent stick removing efficiency, the addition of this set of cleaners would place the plant in a position to handle cotton containing 5 percent sticks without difficulty.

In a new plant for handling spindle picked cotton, two sets of these cleaners with a dryer preceding each pair make an excellent pre-cleaning and drying arrangement, and will take care of the stick problem on this type of cotton.

To handle the stripper harvested cotton on the plains of Texas and Oklahoma which in many cases runs as high as 20 percent sticks, it can be seen that an efficiency of 95 percent is required to produce the required 1 percent as the cotton enters the gin stand. To meet this condition, we have designed a master Extractor which we call, for lack of a better name, a Sling-Off Machine.

At the present we will not discuss the details of the design and operation of this machine since we will show slides and explain it later. It has an efficiency of 80 percent to 90 percent on the type of sticks in stripper harvested cotton of West Texas. This machine plus a set of the Grid Cleaners and the normal efficiency of unit Extractor Feeders enables us to handle the stripper cotton containing 20 percent sticks without difficulty.

This machine is a combination Hull Extractor and stick remover and is used in the place of the ordinary Master Extractors. It has a much higher efficiency on all types of foreign matter than ordinary Extractors.

We had three sets of these machines in West Texas during last season and we got the usual bath of fire that any new machine gets under the faster harvesting conditions in this area. One set operated at a normal plant capacity and gave no trouble. The other two were in new plants where we had stepped up the unloading capacity about 50 percent above normal to see what we could do. In this area, capacity is the number one problem. For a period of about four to six weeks after the strippers start operating all the gins have all the cotton they can gin. Their season's volume depends largely on how fast they can handle the cotton during this period. The limiting factor in the capacity has been unloading and handling the wood. The problem of unloading could be solved but there was not much to gain by improving the unloading equipment if the machines in the plant could not handle the wood at the increased rate.

On these two plants we took a chance on stepping up the unloading capacity believing that our Sling-Off Master Extractors would handle the wood. As usual, the strippers started operating too soon after the freeze and before the stalk and green bolls had dried sufficiently and for a period of about ten days we had considerable trouble discharging the 200 lbs. of foreign matter per minute being thrown into them. However, our extracting efficiency was good at all times. After this period and with some minor adjustments the machines operated the remainder of the season very well except for some mechanical failures which were disturbing but not basic.

Since capacity is the basic problem in this area, we had a very difficult time getting any comparisons on the foreign matter content of the seed from these plants and other plants. Apparently, the premium on clean seed is not sufficient to make much of an impression on the gin owners as we were not able to create much interest from this standpoint. On one of these plants we were able to get a comparison between the foreign matter content of the seed during the 1954 season with that of the 1953 season which the gin owner thought was fair. It was his opinion that the type of cotton being handled compared very closely for the two seasons. On 4,000 bales during the 1953 season the average foreign matter content of the seed was 3.41 percent. For 6,000 bales of the 1954 season, the average foreign matter content of the seed was 1.53 percent. We are not in a position to accurately evaluate this comparison but the customer was very pleased with the results. However, by far his greatest satisfaction came from the fact that he had ginned 6,000 bales in the 1954 season as compared with 4,000 bales during the 1953 season in about the same number of days. He attributes this additional capacity to the stick removing extractors.

We are making some changes in this year's design of the machines in order to increase their ability to discharge the large volume of foreign matter and we feel that this will enable us to handle most any type of extracting problem. We certainly feel that we are able now to handle the stick situation to the satisfaction of the ginners. However, there is another problem in the West Texas area which we think will still hold the foreign matter content of the seed above that which you would like. This problem comes from the fact that the stripper harvested cotton contains a large number of unopened bolls. In order to hold the lint percentage to a competitive level, it is necessary to use very drastic boll breaking devices in order to get all of the cotton out of these unopened bolls. In order to do this, many of these bolls are pulverized into very small pieces. We have found no economical way to prevent an accumulation of these small particles from the bolls in the roll box of the Gin Stand from which they will eventually discharge with the seed. It appeared to us during last season that probably 90 percent of the foreign matter left in the seed after the use of the stick removing machines was small pieces of these broken bolls. Since most of the plants are equipped with Lint Cleaners, this foreign matter does not seem to greatly affect the grade of the lint and for this reason it may be difficult to get the ginners to add a sufficient amount of screen cleaning following the extracting process to remove this foreign matter. We

feel that the penalty for leaving this foreign matter in the seed will have to be sufficient to justify the cost of this equipment.

Another problem which will require considerable help from you is the accumulation of foreign matter in the Gin Stand Roll Box. Although the percentage of sticks and other foreign matter may be reduced to a percentage below that which would cause operating trouble or materially affect the grade, there will still be an accumulation of these in the Roll Box. Usually the seed roll is dumped when it gets so full of foreign matter that it will not turn. This roll full of foreign matter is dumped into the seed and sold to you. Long before the accumulation reaches the point of causing the roll to stop, the saws start grinding up the trash and discharging a considerable portion of it with the seed. We know that you recognize these problems.

There are some areas where the penalty for foreign matter in the seed is apparently very slight since we still have requests for the trash discharge of our gin to be so designed that the foreign matter can be turned into the seed.

We do not know how serious this problem is for you but it is discouraging to spend as much effort as we do in trying to keep the foreign matter out of the seed and then have buyers to ask us to make expensive changes in our equipment in order to return the foreign matter to the seed.

In approaching this problem, we felt that ginners could not afford to buy special machines for removing sticks and accordingly we worked along the line of developing machines which would have a high efficiency in removing the normal hulls and leaf as well as the sticks. After about three years of effort in this direction, it appeared to us that the wide variation in spindle picked and stripper harvested cotton made it necessary to divide the problem into these two categories.

e found that master extractors were not efficient in removing leaf trash and since spindle picked cotton contained a very low percentage of hulls, these machines would not be justified on this type of cotton if a less expensive way could be found to remove the sticks. The addition of a set of the grid cleaners gave us the necessary efficiency to solve the stick problem on this cotton and also gave us about 70 percent efficiency on leaf.

The development of the Sling-Off Machines for the stripper harvested cotton started back in 1949. A tremendous amount of work went into the project in trying to develop a machine which would have sufficient capacity for the larger plants and yet sell at a price which the ginners could afford. The cost of these machines runs about 45 percent more than ordinary master extractors, or about $4500.00 more on a large plant. As far as we know, it would be difficult for the ginner to make this extra investment pay if he depended on the premiums from cleaner seed. In order to justify the extra investment then the ginner must be convinced that he can gin more bales per hour or in some other way make them pay.

We feel that, with the developments made by not only us but by the industry as a whole, the answer to the stick problem is available to the trade. It will naturally take considerable time for these developments to come into general use. In the meantime the industry needs any help possible from you in the way of incentive and encouragement to the ginners to get this equipment into general use.

DISCUSSION

(Mr. Vandergriff showed a series of slides referred to in the following discussion.)

Brawner: How many baskets does a machine have for cleaning purposes.

Vandergriff: There are six in each machine and a set which consists of two 6 cylinder machines, making 12 cylinders. They all have the type of cleaning surface I just mentioned. Cylinder cleaners are made in 2, 4, 6, 8, 9 or 10 cylinders. (Mr. Vandergriff at this point showed a slide of a machine which will remove 30% of the sticks. He then proceeded to point out another one which had a minimum efficiency of stick removal of 40%. He recommended a set for handling the stick situation on the spindle picked cotton, assuming the plant already had a fair amount of stick removing efficiency which will enable the handling of, up to around 5% sticks, which is about as much as you ever have in spindle picked cotton. This is the machine which we call our Sling-Off, or Stick Removing Master Extractor. (Mr. Vandergriff explained in detail the use of this machine)

Roberts: Do you have a boll extractor at the end of that machine?

Vandergriff: No, this is the boll extractor which would replace the Master Extractor in the gin or if you were building a new plant this would take the place of an ordinary extractor.

Smith: What effect does trash have on the grade of cottonseed?

May: It has really a double penalty in that the foreign matter up to and including 1% is included in calculating oil and ammonia present in the seed, but above that the foreign material is deducted from the weight,does not become part of the grading system, and is put on the certificate beneath the grade. Approval of the Department has been given that the foreign matter should be deducted from the gross weight and paid for on the net weight. In addition to that,there is a quality discount for excessive foreign material.

Vandergriff: Thanks a lot for your comments that there is no economic justification for putting it in there. In the West Texas situation apparently all that is done is to determine the amount of foreign matter and deduct it from the total tons. If it is determined that there is 3% foreign matter in the seed, you allow them 1%, you borrow 1%, so you deduct 2%. That's really no penalty. That is being generous.

Verdery: It is my understanding, there is also a quality discount. Isn't that right, Bill Coleman?

Coleman: Sure.

Verdery: I still do not understand why they want to keep on putting the trash in, why there isn't more incentive to get it out.

Vandergriff: That is what I'm trying to determine. I have had a very difficult time creating interest on the part of the ginners, and what I am trying to do is to bring about some thought on your part as to what is the incentive to the ginner.

Verdery: Maybe some of these mill managers can explain that.

Vandergriff: Perhaps I am out of order in proposing the issue here, but I just wanted you to think about it a little bit and see if you could help us out from that standpoint.

Mays: That is reasonable.

Vandergriff: I find that ginners really do not know the situation. For some reason they do not know what is to be gained by keeping the seed clean, for instance. We can not go out and sell this equipment on the basis that you are going to have clean seed.

Mays: It is a very simple matter to take a shipment, a lot of seed, 25 tons and figure it in dollars and cents. The situation really looks different when you put figures down. Figure it with and without and give them the net return in dollars and cents. I think that ought to convince them.

Vandergriff: I was under the impression that it would certainly pay a cotton ginner to invest money in some equipment to keep the seed clean, but when I went looking into the thing I wasn't sure whether I was right.

DEVELOPMENTS IN CLEANING COTTONSEED AT THE OIL MILL

By

M. C. Verdery
Anderson, Clayton & Company, Inc.

At the first oil mill clinic meeting in 1952 it was emphasized that the cottonseed oil mills' No. 1 problem was to improve the quality of chemical linters. This called primarily for improved cleanliness or less trash in the lint and although some improvement can be made by auxiliary lint cleaning devices, it is pretty well agreed by all of us who have worked on this committee for the past three years, that we must make drastic improvements in present methods of seed cleaning before this objective will be accomplished.

Phenomenal growth has driven the rayon industry to the development of cellulose raw material resources of unlimited supply and low in cost. Wood pulp of the type generally classed as dissolving or chemical grade has been the answer to the demand. Advances in the technology of wood pulp, given additional impetus by the wartime demand for greater production, have made possible its almost 100% replacement of other cellulose materials, particularly chemical cotton. During the last 20 years, the effect of these improvements in wood pulp has driven chemical cotton from a high of 44% of the rayon industry's base material to 11% in 1953.

I will not burden you with pages of statistics which have already been quoted us on numerous occasions, but will summarize the situation by stating that chemical linters have been fighting a losing battle with wood pulp and we must make still further improvements in second cut lint quality if we are to hold the limited markets now available to us, and make any profit at all from the delinting operation.

In order to make intelligent efforts to improve lint quality we must know exactly what is required and to arrive at this information we have consulted with representatives from two of the large pulp plants and obtained their ideas as to specific grade requirements. Top quality chemical lint will be referred to as Grade "A", second as "B", and third as "C" and the

next lower grade as "C Hold". Samples of these types are available for your inspection and you will note two separate groups of these types. One is from short fiber low yield seed and the other from seed with a higher percentage of lint. The "A", "B", and "C" grade specifications have nothing to do with color or staple and are based primarily on trash content. You will note that the "A" lint has a very minimum of foreign matter and is frequently referred to by the lint graders as "Export Lint". The "C" lint at most of our mills is what we have in the past called pretty fair lint and has been accepted for the past two years on government tenders and normally by domestic pulp plants. Not so today. It might now pass on government contracts but we were told by one of the big chemcial buyers that "if and when they buy any chemcial lint in Texas it must be Grade "A".

Now, Grade "A" lint, as you can see from these types, is pretty hard to produce at most mills and just about impossible to produce on average seed in West Texas. If you are having trouble making this Grade "A" second cut lint, I suggest you analyze the seed going to your first cut linters and if they contain in excess of .50% trash, you are just about butting your head against a brick wall. All of the basket cleaners, pneumatic cleaners, beaters, and other devices in the world will not usually make it possible to produce Grade "A" lint from "cleaned seed" containing in excess of .50% trash.

As we have demonstrated and explained last year, the very best seed cleaning arrangement we know of removes no more than 65% of the total foreign matter in seed and I would say that most mills average less than 50% removal. Therefore, the average mill, in working seed with 1% F.M. will still have at least .50% F.M. in seed going to the linters. Most mills in the Mississippi Valley, and our western mills working irrigated seed, usually receive seed not exceeding .6% to .7% F.M. and with almost any kind of seed cleaners can normally reduce the F.M. to less than .50% and should be able to produce an acceptable lint.

At Lubbock last year an extensive series of tests indicated that with 1.10% F.M. in seed to the mill they could make about 90% "B" grade lint; with 1.50% F.M. in seed about 50% "B" grade; and with 2% F.M. most of the second cut graded "C" or lower. Still higher percentages of foreign matter made it difficult, if not impossible, to produce "C" grades in spite of the best available seed cleaning and lint treating equipment and good supervision.

All of the above confirms that proper seed cleaning is the answer to improved lint quality but in spite of the efforts of your Committee and many others, for the past three years, we are still unable to offer you a "package unit" or any combination of equipment to do the job as it will have to be done.

The only hopeful development as of now, that I know of, is a "Stick and Large Trash Machine" developed by one of my associates. Bill Phillips made a report on this development last summer at the Short Course at A & M College and his complete paper, with illustrations, was published recently in the Oil Mill Gazetteer. This machine will remove 75% to 85% of the sticks as compared to perhaps 25% removal by the normal shaker trays or reels. It also removes a higher percentage of large trash and should make it possible to greatly improve existing methods. One of these

machines, operating after the present pneumatic cleaners, should be able to handle up to 150 tons of seed per day. We have recently entered into a contract with Bauer to build and sell this new seed cleaner and we hope to have the first machine for trial by next season and that they will be available to the industry in 1957. No doubt one of the Bauer Bros. representatives at this meeting will give you further information on this development.

Until such time as the above machine, or something better, is available, we have no choice but to continue our efforts to improve on existing equipment and methods. The Bauer or Fulford pneumatic cleaners are the work horses in this department and about all we have at present to get the job done. Although not as effective as we would like, at best, there is a vast difference in what can be done with this machine under different conditions. With reasonable loads to allow minimum size perforations on the boll deck, it will remove up to 60% of the F.M., whereas when overloaded it may not remove over 25% of the F.M. With the Bauer cleaner double decked to allow minimum loading not exceeding 35 tons per tray, or a total of 70 tons per machine, it will give maximum efficiency. With the normal single deck machine it should not handle over 40 or 50 tons per day for best results.

After doing everything possible to obtain maximum efficiency from a pneumatic cleaner and when the average F.M. in seed consistently averages in excess of 1%, it is absolutely necessary to resort to various auxiliary or supplementary devices for additional cleaning of seed and lint. There is no one cure-all and actually all of these little gadgets and "trick" devices each removes a relatively small percentage of trash from the seed but they all add up and in many cases make the difference between "A" grade and "B" or "C" grade linters.

Many mills utilize perforated bottom conveyors and perforated rotor lifts before and after the second cut linters and although these devices remove an almost negligible percentage of trash they probably help some and are usually inexpensive to install. The most effective auxiliary device is the basket cleaner, perforated seed chute or other devices for removing trash from the seed between the first and second cut linters. The basket cleaner is handling seed from each first cut linter, is used extensively in West Texas and will remove somewhere between 7% and 15% of the trash in seed at that point. For example, if the seed leaving the first cut linters contains .60% F.M. and with the basket cleaner removing .10%, the F.M. in seed would be reduced to .50% which in some cases is very helpful.

Allen Smith has developed a perforated bottom seed slide in the spout from each first cut linter and this device will be reported to you in detail at this meeting. Based on one comparative test at a West Texas mill, Allen's slide removes just about the same percentage of trash as the basket cleaner and it is less expensive to install and operate. On this test, working seed with about 2% F.M., a basket cleaner removed 2.01 pounds of trash per hour. The linter was handling 24 tons of seed per day, which would result in a trash removal of 2 pounds per ton of seed. This trash consisted of 72% seed, meats and lint, so the actual trash removed was only .56 pounds per ton of seed. In this particular case the Seed Cleaners were removing 65% of the trash, leaving the seed to linters

with .70% F. M. After leaving the linters (without basket cleaners) they contained .40% F.M. This confirms that first cut linters really do considerable cleaning. This would amount to 8 pounds of trash in each ton of seed at this point and with the basket cleaner removing .56 pounds per ton, we would say that the efficiency of this device is only 7% i.e., in removing 7% of the trash from the seed handled.

A similiar test on the Allen Smith slide found it to be removing 1.71 pounds of trash per ton as compared to 2.01 pounds with the basket cleaner. At first glance this would appear in favor of the basket but a careful analysis of the trash fractions from the slide found it to contain 38% actual trash and 62% seed, meats and lint and, therefore, the actual trash removal was .65 pounds per ton as compared to .56 pounds with the basket.

My reason for giving the above exact weights and calculations for the efficiency of these devices is not to discredit either of them but to warn that in observing devices of this kind in operation, and to see an accumulation of trash on the floor or in a container, is often misleading and means absolutely nothing until you have weighed, analyzed and calculated its effect on the total trash content of the seed being treated.

Until we have accomplished our objective and developed a really efficient seed cleaner, we must continue our efforts with auxiliary devices as outlined above as well as with adequate lint beating, pneumatic cleaner on linters, whirligigs, Super Jets and every known device. The above information on the subject of cleaning seed between first and second cut linters indicates that in removing only 10% to 20% of the trash we have a wonderful opportunity for improvement at this stage of our processing. I understand one or two installations of multiple basket cleaners have been made to handle seed from first cut linters and that this machine will remove in excess of 50% of the remaining trash, but we have no specific information as to the results. If a suitable machine could be developed that would remove in excess of 50% of the remaining trash, I believe it would be helpful in improving chemical linters at any mill.

All of our best efforts will be required from now on to keep the delinting operation out of the red and, in fact, I know of several mills right now that would be better off financially if they could discontinue second cut linting. Most of us in this business have for years dreamed of Chemical Delinting but now with very little, if any, profit in second cut lint, I predict that a chemical or some improved process will soon be developed that will allow us to produce a cellulose product of greater value than the best imaginable chemical lint. Do not relax your efforts toward our immediate objective of better seed cleaning as we will probably have even greater need for it with new delinting processes yet to be developed.

DISCUSSION

Brawner: In referring to trash, do you mean foreign matter in the seed? You don't mean generated trash.

Verdery: I mean foreign matter in the seed as it comes to the mill.

Brawner: Possibly you have heard some people mention in the years past that we could not hull very easily especially during dry years. Is that particularly a problem of the Southeast?

Verdery: I understand that is is. I will say here gentlemen, that I haven't given you much information. There were two points that I was trying to bring out. First, to know just what we are trying to do to get a definite idea from the chemical linter people as to what they want. The second thing is to have some correlation between the type of lint you can produce and a given type of cottonseed. In other words, if you got a high trash content, you are definitely limited with the existing equipment and you are just beating your head against a brick wall trying to make money out of something else. When I first saw the basket cleaner and checked up and found it was only removing 1/2 pound of trash per ton of seed, and we needed 8 pounds removal of trash per ton of seed at that particular point, I said, it is not effective enough. Since we have been fooling around here a couple of years and haven't anything better for it, so we might as well go ahead and use it. Get the old 7 or 8% out. Try to get another machine to get another 7 or 8%, then get working on down the line.

Rogers: How much trash could the Gins keep out if the penalty was high enough to make them keep it out?

Verdery: That depends altogether upon the type of cotton they are working. Maybe the best they could do would be 1.50%.

Vandergriff: Yes, I would say 1-1/2%.

Verdery: 1.50% on normal West Texas seed, would be fine. The trash content averages in the Lubbock area around 2%, but lots of it is as high as 10%.

Brawner: I made a discovery last week that some of the gins have these new lift cleaners. They fit on the back of the cotton gin, take weeds, trash, slivers of sticks and things out, that happen to get into the cotton mechanical harvesting mainly in the Southeast. I discovered 1 or 2 gins using the discharge air from these cleaners, which air has all of the trash and moats in it to blow the seed to the seedhouse. In the remarks about this mill we noted it works pretty good, it mixes the trash in very well with the seed, where it was not so noticeable.

REMOVAL OF STICKS AND OTHER FOREIGN MATERIAL AT FIRST CUT LINTERS

(a) Use of Wire Slide

By

Redding Sims
National Blow Pipe and Manufacturing Company

The wire slide that we are presently interested in is not a new idea. It is the application of it. For many years wire or perforated metal has, at many mills, been used to help remove some of the foreign materials from the first cut delinted seed. Several years ago when this wire (1/8" x 3" slot of .08 or .092 wire) slide was first installed, it was placed directly in front of the linter and became a part of the seed chute. Having been almost at a vertical angle with respect to the floor, the seed when falling

from the linter would strike the wire and bounce back into the seed conveyor. At this angle, only the foreign matter which struck the openings at the correct angle would be separated from the seed.

In addition to changing the wire from the vertical position to an angle, approximately 45°, the seed would slide from the wire, a crimp or break in the metal, approximately 1" deep, was placed about half way down the slide. This break was to cause the seed and foreign matter to change position or give a tumbling-like motion as they made their way on the discharge side of the slide. Another feature that may be mentioned is the bounce board. This is placed near the top where the seed strike when falling from the linters. The reason for this bounce board is two-fold. First is to deflect the seed from falling short of the full width of the wire slide. Secondly is to check or slow the speed of the falling seed causing them to strike the front side holding the top part of wire. When the speed of the seed is slowed down in this manner the wire slide will perform at its highest efficiency.

The wire slide mounted as described removes just a little more than three times the amount of trash it will when placed in a vertical position.

The seed milled when the first test was made contained about 1% total foreign matter. The seed passed through the sand and boll reels at the rate of 65 to 70 tons per day. They also passed over Bauer Bros. cleaner at the rate of 45 to 47 tons per day.

The first cut linters removed 29 to 30% amounting to 58 to 60 pounds of lint per ton of seed. At the first cut linters the wire slides removed about 32% of the total trash that would have gone to the second cut linters. The amount of trash that the slides removed was a little more than 3 pounds for each ton of seed milled.

Mr. L. N. Rogers, Buckeye Cotton Oil Company, Pulp Division, was kind enough to make all the necessary tests to determine the relative value o f the lint produced with and without the use of the slide. The first complete test was made on November 15th and the results were as follows: Without the slide, the dope color was 7.0 and shale count 9. With the slide, the dope color was 5 and shale count 4. This shows a reduction of dope color of about 30% and a reduction of more than 50% in the shale count. Or "in other words the cleaning given the seed made acceptable linters from non-acceptable linters." The second complete test was made Jan. 4, 1955 and the results are as follows: Without slide the dope color was 3.5 and shale count of 9. With slide the dope color 3.3 and shale count of 7.

An explanation as to why the second series of tests did not show as good reduction in shale count as first test may be due to an excessive amount of cocklebur.

DISCUSSION

(Mr. Allen Smith gave a short running discourse on what was taking place in his plant as shown on the film with particular emphasis on trash and sticks collected.)

Jones: Did you analyze the trash similar to what Verdery mentioned there a while ago? How much seed and meats were in that separation?

Smith: The first test was made in November and at that time the

seed we received contained 92 hundredths of 1% total foreign matter which consisted of sand, bolls, and all the trash remaining in the seed. After that the seed went through the sand and boll reel over the Bauer Bros. cleaners, and I do not know what the actual sticks and foreign matter in the seed at the first cut linters was. To test the end product, I went to the bulk of people who bought the linters and got them to tell us what they were worth—which was the better of the two lints. By actual sight, on the first hamper, the lint made without the use of the slide appeared a little bit darker. I could see a little bit more trash than the lint produced while the slide was in operation. Relative to the second test, (which there were pictures and samples of) the result from that test was not as good as the first seed. I have samples here of the actual foreign material that was removed from the delinted seed, and you will notice some cocklebur in there. Mr. Rogers would you care to comment on what happens when the cocklebur goes into your digester?

Rogers: I mean we cannot get the cocklebur out. We have to cook, bleach, and treat it.

Smith: For that reason, we are going to have to get a better device to take out the cocklebur.

Beckham: Has there been any trouble from that screen blanking over after several hours running?

Wiley: The screens were brushed every 2 hours.

Smith: They will clog up, not completely, but in order to get your maximum efficiency it is necessary to take a wire brush and just brush it underneath on the bottom side.

(b) Other Methods

By

Dick Taylor
Southland Cotton Oil Company

I appreciate this opportunity of meeting with you again, and while I have nothing new to report on equipment for cleaning cottonseed, it is my conclusion that the job will have to be done in stages and further reduction made in foreign matter wherever possible.

Very dry weather for the past several years in Central and East Texas, coupled with an ever increasing tendency toward mechanical harvesting of cotton is posing a problem which is getting harder and harder to cope with. Mechanical harvesting, of course, is becoming common to all of us.

We are not troubled so much with first cut lint quality, and would have less trouble if we could eliminate the bald, semi-bald, shriveled and dried up seed along with considerable trash which escapes our present cleaners. In order to accomplish this, we are working on a cleaner feeder which promises to do a fairly good job on this culling operation. This operation, the way we see it now, would require detaching present linter feeder and raising it enough to make room for a drum covered with carding cloth between feeder and linter. This drum, depending on where the seed

comes in contact with it, will pick up all seed having lint enough on them to make a first cut justifiable and will reject the others together with a very large percentage of foreign matter. The degree of rejection is controlled by the point where the seed comes in contact with the drum. Seed contacting the drum even with, or above a horizontal center line would have more tendency to follow over, than would be the case if the contact was made lower down on the drum-this applies especially to sticks.

The above has the advantage of handling seed in small quantities as the Density Regulator still controls flow of seed to the linter. It has been our experience that seed have a tendency to separate in a line of conveyor feeding linters-the first linter in the line usually gets more trash and the last machine gets the best seed. An individual treatment ahead of each linter would be very desirable and would lessen irregularity in production.

The rejects from this operation will have to undergo another cleaning but it will be much simpler than the first due to the fact that you are not dealing with volume or fuzzy seed. A lot of the seed and all the trash from this operation would go to the huller room.

We are working on this idea and have a feeder under way, but we will not have it far enough along to give it a try under actual operating conditions before another season.

It is my opinion that cleaning between operations or cuts is essential.

THE IMPORTANCE OF INCREASED ECONOMY AND EFFICIENCY IN DELINTING COTTONSEED

By

J. H. Brawner
Southern Cotton Oil Company

Recently, the demand for linters, and the prices of linters have decreased considerably. This naturally is causing much concern to oil mill people as reduction in linter values reduces the gross return for cottonseed products.

Because of these present conditions, I think you will be interested in trying to calculate or estimate what it does cost to produce linters.

Before I start, I want to point out that it is impossible for me to calculate a cost of linters production that will fit all mills exactly. The type of equipment, the labor rates and the power rates are some of the factors that can vary widely from one mill to another.

All I can do is give you some approximate figures for what I think is a typical mill. The mill I have in mind crushes 125 tons per day for 160 days or 20,000 tons per year. I would use 25 linters in this mill, and there would be two saw-filing machines, a side filer, two lint beaters, and two baling presses. The estimated total cost of the machinery is $181,000.00.

A building to house the machinery, and a 10,000 square foot linters warehouse will cost approximately $46,000.00.

In addition, there usually is a fork truck costing $4,000.00 or a little less.

The total of all these items is $231,000.00. Fixed overhead should be approximately 10% of the total investment, or $23,100.00 per year. On a per ton basis, this is approximately $1.16 per ton of seed.

The direct operating expenses in our typical linters room will be approximately as follows:

Labor	$0.82/ton
Maintenance material	0.15
Power	0.71
Saws	0.12
Gummers and files	0.04
TOTAL	$1.84/ton

Bagging and ties is an important item of cost. At the present time, this cost is approximately $1.56 per bale. For a net linters cut of 200 pounds, and with an average net bale weight of 600 pounds, the cost of bagging and ties will be $0.52 per ton of seed.

There certainly should be some charge for supervision. It is estimated that at least $3,000.00 per year should go against linters. This amounts to $0.15 per ton.

The cost of the raw material out of which linters are made is a tough thing to determine. I suppose the best thing to do is to base our cost on what would happen to linters if we reduced the linters yield or quit cutting linters entirely. As you know, if this happened, linters would become hulls. Therefore, for our purposes, we probably should use the hulls price as the raw materials cost of linters. At present price levels, loose hulls have a value of approximately $14.00 per ton. Two hundred pounds of linters, therefore, would cost $1.40 per ton of seed.

Summarizing all these figures we come out with the following:

Fixed overhead	$1.16 per ton
Direct expenses	1.84
Bagging and ties	0.52
Supervision	0.15
Raw Material	1.40
TOTAL	5.07

For 204 pounds of linters sold, the cost will be $0.025 per pound.

As you can see, this is too close to the present cost of second cut linters to be comfortable, and it behooves all of us to do everything we can to increase the economic efficiency of our linters rooms.

DISCUSSION

Verdery: Supposing after a calculation we decide we are losing money making second cut linters. Are we just going to quit making them? Do you feel that the hulls can be sold satisfactorily? Will managers claim they can not sell them? Are we going to get reasonably good separation, to say nothing about the first cut linters?

Brawner: I do not know. The last time I attempted something like that I got some pretty bad separation. It would depend on the individual mill, and what they did. The one helpful thing about linters production is that everytime the linters market gets difficult, the cutting begins to fall off and after a while the need for linters exceeds the supply, or comes up to the supply, and the surplus is disposed of. But now there are synthetic fibers, and apparently woodpulp is taking over markets that linters used to have so we may one of these days cut back on line, and that usually happens when we do not have any market. As yet it hasn't happened, but when it does then we will have to teach the farmers to like woolly hulls again.

Smith: Several years ago, Mr. Verdery and T.P. Wallace were discussing how far one could go in removing lint from the cottonseed. Even if hulls could be sold at $20.00 per ton, how low a price could one afford to take for second cut linters and still make money?

Verdery: Those figures have to be average and it is amazing the difference in the cost of producing lint at different mills. Incidentally, there are all kinds of ways of estimating the costs of producing linters. I figure we already have the investment in the linters room equipment, with depreciation, interest, and taxes, so I don't see how a mill that is already equipped can consider the production cost. I always approach it from the other direction of what I would save if I quit producing linters. On that kind of a basis and the present price of hulls, I figure we are breaking even today and at most mills the breaking point is 2¢ a pound for linters.

Lyle: Are there any advantages in making a third cut, and what are they?

Verdery: In lots of places it pays to make four cuts. Take a test linter, and try to determine the efficiency of three cuts, or four cuts; I do not think at the overall average of efficiency, you would be producing it for any less per pound, and theoretically you wouldn't produce any more lint. In actual practice the biggest advantage in making three or four cuts is that the linters do not have to be kept adjusted so accurately.

Lyle: How about your power capacity?

Verdery: I think the total power is about the same, but it may be a little less in that you are not crowding any one level.

MEASURING LINTER ROOM LOSSES

By

M. H. Fowler
Buckeye Cotton Oil Company

Linter room machinery is a very heavy portion of the investment in an oil mill. You all know that modernizations in recent years have required large expenditures. Many mills have converted their machines to use more saws on each mandrel. Individual condensers have been replaced in a great part by flue systems and brushes by brushless attachments. Cleaning equipment is becoming more elaborate. Even the basic costs like cutters and saws are costing more, as is the labor to operate them.

On the other hand, the value of the linter products that must pay these costs has held relatively constant at about eight to twelve per cent of the total product value from cottonseed.

Linter room efficiency and particularly lint losses, then, must be under closest observation by all of us. Naturally, to control lint losses we must have a reliable way to measure them. But first, let us consider the nature of lint losses as we can see them.

The first is lint remaining on delinted seed. We know that this can be held to about 1.5 to 2.5% of the delinted seed weight with normal operation. We know that it varies some with seed moisture, amount of lint on original seed, through-put of the linters, saw sharpness, mechanical adjustments, etc.

Second, we would place cleaning losses. As we remove more trash and bran to meet quality requirements, we lose more linters fiber with the cleanings. Flue bran normally removed from second cut linters may contain two pounds of fiber per ton of seed under good control. It sometimes contains three or four times this much. Motes are not usually considered a loss because good motes are salable. However, in producing good motes we often clean out a pound or two of good fiber into hull product or discard.

Third, flue and collector losses have to be considered. In this group we can put losses that are caused by choke-ups. Scattered linters from a cyclone choke-up can be seen on many oil mill roofs and yards. A steady discharge of linters from a cyclone can easily be seen and the remedy is usually simple, so it is difficult to imagine this loss being more than two or three pounds per ton of seed.

We have said that we must have a reliable measure of these losses in order to evaluate our operation. More specifically, the requirements of such a measure are:

1. It must include all losses of whatever nature. (Here we can almost eliminate one of our tools, per cent lint on delinted seed, since is is obviously only a partial measure.)

2. It must reflect operating efficiency clearly.

3. It must vary in a reasonably consistent way with total lint on seed and with the number of delinting devices. This requirement is listed because it is necessary to know how much of an observed lint loss is due to these variables in comparing one mill to another or one seed lot to another.

There are available to us in Official Methods or published reports a number of tools that are useful in devising a measure of lint losses. AOCS Methods include what we need to determine moistures, lint on seed, and pot cook yield (which we will call per cent cellulose for brevity). A method for determining foreign material in linters was given by Mr. Rettger in Oil and Soap, July 1945.

The method for foreign material, as published, does not determine all of the non-fiber material in linters but only that part larger than 40 mesh. Second cut linters contain foreign material larger than 300 mesh varying from about 7 to 17% by weight. We believe the 300 mesh screen retains essentially all of the foreign material. However, using a 300 mesh screen with Rettger's method is extremely time consuming. A 100 mesh can be used easily and the relation of 100 to 300 mesh foreign material was determined experimentally to be --

$$FM_{300} = 3.19 + 1.32\ FM_{100}$$

With these methods and the mill accountants' linters yields in pounds per ton of seed, it is possible to measure total lint loss in two ways. We will call these, "Foreign-Material-Free or Clean Lint Basis" and "Standard Cellulose Basis".

On the Clean-Lint Basis, it may be assumed that the lint on seed as determined by analysis contains no foreign material. By converting all lint products to a standard moisture basis and deducting the 300 mesh foreign material, pounds of Clean Product are obtained. The difference between total lint on seed and clean product is lint loss.

There are some objections to this method. In the Southeast, especially, seed varities are such that the seed shatter easily in the linters. Rather large amounts of oil are found in second cut linters. Part of this oil is present in very fine meats particles, and part of it is actually deposited on the fibers. Now to treat this oil in the calculation is a problem for which we have no good answer. These fragile seed varieties have not yet come into the Valley.

The Standard Cellulose Basis is a little more complicated and perhaps a little more reliable measure of lint loss. This method is essentially a cellulose balance. To begin, it is necessary to decide the cellulose value of lint before it is cut off the seed. An assumed value (something over 82% cellulose in 8% moisture lint) may be used. A refinement is possible. By beating most of the short fiber out of first cut linters the true nature of the lint on seed can be approximated. Cellulose in this beaten first cut will run 82.5 to 84.5% on a foreign-material-free, 8% moisture basis. This can be assumed to equal the cellulose in lint on seed. By subtracting the cellulose in all linter product from cellulose in lint on seed the cellulose loss is obtained. Cellulose loss may be converted to lint of any cellulose value desired. It is not usually necessary to determine cellulose in motes, but it is advisable to determine foreign material and then to estimate cellulose in clean motes. It is necessary for good comparisons, to calculate the loss to a standard seed moisture. It is convenient to convert it to per cent of lint on seed in setting a standard for several mills.

Lint Loss calculated by either method described meets our requirements for a measure.

1. All losses of lint are included.
2. It varies directly with total lint on seed.
3. It varies inversely with through-put rate.
4. It is sensitive enough to reflect operating efficiency clearly.

We have found Lint Loss to be most useful as a control and we use it routinely. It is most helpful in comparing new methods and equipment. By changing one thing at a time and watching the affect on lint loss, a better understanding of many linter room problems can be had.

DISCUSSION

Brawner: What do you consider a normal loss for a lint room?

Fowler: I'd rather not say because it varies with the number of linters in use. From this, 1 lb. of lint per linter per day difference ought to make about 5 to 8 lbs. of lint loss difference.

Mays: Did you say that you would give the rate of 82 to 84 as the cellulose yield of lint on the seed?

Fowler: Yes, that is what we get when we clean up the first cut linters. Run a percentage of foreign material on that, and convert the cellulose to a foreign-material-free basis. We had all the short fiber that might go through the washer.

Verdery: It sometimes goes as low as 76.

Fowler: Yes, that is the reason for doing just that thing, rather than taking a fixed figure.

UTILIZATION OF COTTON LINTERS FOR PAPER MAKING

By

M. D. Woodruff
Bauer Brothers Company

The scope of this paper will be limited to the use of cotton linters as a substitute for cotton rags in rag content papers. Rag content papers have longer life than papers made entirely of wood pulp and are used for deeds, bonds, stock certificates, life insurance policies and similar documents requiring long life.

At last year's meeting, Mr. Burton B. Annis reported on the use of cotton linters in paper making. He pointed out that in the manufacture of rag content papers, it was becoming increasingly difficult to obtain a sufficient quantity of suitable rags due to the addition of synthetic fibers which do not respond to conventional treatment for paper making stock. Furthermore, the price of rags fluctuated widely. He reported on a cooperative development with Anderson-Clayton to produce cotton linters of uniform length and uniform cleanliness as a substitute for cotton rags. While this development had met with some success, cotton linters lacked

some of the desirable properties of rags.

Shortly after the New Orleans meeting, the Bauer Brothers Company set up a series of experiments in their laboratory to add further knowledge to the processing of cotton linters. The following men attended. Mr. P. S. Cade, Harding Jones Paper Company; Mr. L. L. Holzenthal, Southern Regional Research Laboratory; Mr. M. C. Verdery, Anderson, Clayton Company; Mr. E. H. Bindley, Cheney Pulp and Paper Company; Mr. Myron Wittmer, Cheney Pulp and Paper Company; Mr. Zilmond Voss, Ward Voss Associates; Mr. Burton B. Annis, Ward Voss Associates; Mr. Gerald Franks, U. S. Ginning Laboratory; Mr. R. R. Sitzler, Celanese Corporation; Mr. K. P. Goehegan, Howard Paper Company.

Experimental runs were made thru Bauer centrifugal cleaners, with both raw linters and cooked linters in water suspensions. These units proved so effective in removing hull fragments and other foreign material, that a committee of the American Writing Paper Association reported that no further development work need be done along this line.

Both raw and cooked linters in water suspensions were treated in Bauer Refiners, but here the results were not encouraging as a large power input was required and the refined linters did not produce as strong a sheet of paper as cotton rags. Prior to these tests, a committee of the American Writing Paper Association had had similar tests made on other types of refiners but without obtaining satisfactory results.

Shortly after the experiments at Bauer Brothers Company, the committee met and decided that a basic research program should be instituted to learn why cotton linters did not behave like spinable cotton in the manufacture of rag content papers. The Institute of Paper Chemistry, Appleton, Wisonsin, was selected as being best equipped for this study and a contract was made with them. The program is under way and studies are being made of both mechanical and chemical treatments. It may be two years before the work is concluded.

When the work is completed, and if it is successful, the Institute will report the type of mechanical treatment required and it will then be up to engineers to translate these findings into commercial processes. The Institute had developed a theory that in making paper, cellulose fibers are held together by a weak chemical bond and by chemical treatment, they have been able to strengthen or weaken this bond. Therefore there is grounds to believe that cotton linters will respond to a chemical treatment to improve their paper making qualities. If a successful method is found, the Institute will report the procedure and again it will be up to engineers to translate it into commercial techniques.

The present approach to the utilization of cotton linters in paper making appears to be very sound as little is now known of the fundamentals involved, and while much time and money have been spent in trying to adapt existing equipment for the purpose, the results have consistently fallen far short of the requirements.

The establishment of this research program does not mean that other approaches to the problem have been abandoned and as new equipment is developed, it will be tried. We recently conducted tests on a new type of disc refiner in which the rate of material travel across the disc can be controlled. The initial results were promising and a more extensive test has been scheduled for later in the year.

DISCUSSION

Berkley: Did you get from the paper industries any information regarding the construction of the linter fibers compared with the lint fibers? What are their major differences?

Woodruff: Yes, in a very general way. The linter fiber is a larger diameter fiber, and has a heavier wall than a spinnable cotton fiber. One is not a fragment of the other.

Berkley: He did not mention the internal structure?

Woodruff: No, he did not. I know they are going to do some X-Ray work along that line. I have learned nothing definite.

Berkely: Is that true hydration?

Woodruff: Bonded paper is not hydrated. Government bonds are printed on hydrated paper that crackles when you shake it. Cotton linters won't hydrate and they do not tend to join themselves to a neighboring fiber. The chemical bond is very very weak.

Berkley: Just what are the chemical constituents of fibers? Is the difference caused by chemical structure?

Woodruff: It is very possible. Dr. McLaurin is very hopeful of this chemical approach rather than a mechanical one. He thinks we can do something chemically to cotton linters to make a good sheet of paper.

Fowler: I did not quite understand why a small amount of synthetic in the rag is so difficult. Won't it bleach or thread?

Woodruff: Most of them won't bleach and simply will not make any kind of paper at all. The fiber itself is very weak.

Spadaro: If some impurities like rayon, or if some of those synthetic fibers get into the pulp in the processing it will be disintegrated into small pieces and later show up on the final paper as a spot, translucent spot, or that type of spot which would naturally ruin the paper, and it does not take much of that synthetic fiber to ruin a big batch of pulp.

Woodruff: That is certainly true, and I've seen that happen in paper mills.

Spadaro: Is it possible that the linters won't fibrilate like the lint cotton? The lint cotton, I understand, in hydrating in the beater, fibrilates better than the cotton linters. Do large diameters prevent that fibrilation?

Woodruff: The Institute is getting away from the theory that fibrilation tends to make good paper. They are now going on the theory that you actually have a weak chemical bond between the fiber and thats where you get a good sheet of paper. This fibrilation theory means you fray off little fragments of the fiber itself and they project out from the main column of the fiber and give you a mechanical interlock. That is one of the older theories of what makes a good sheet of paper, but I don't think anyone can speak with much authority on that subject. All work of a commercial nature has not been stopped. We've just set up a machine in our own Laboratory which has a controlled rate of flow across the planner discs, which are open; that is also being applied commercially. It may be by lengthening the extension time that the fibers are held by the open discs that we may be able to get some results.

DESIRABLE CHARACTERISTICS IN COTTON LINTERS AS THEY RELATE TO (a) PRODUCTION (b) MARKETING

By

W. C. Manley, Jr.
Memphis, Tennessee

A great variety of production schedules, equipment and finished linter products is found in our Valley division. All of this variety comes with a supply of cottonseed predominately D & P L 15.

These seed do not vary as much in total lint as we had thought prior to making a few investigations. The high is about 11.7 and the low is about 9.9. Of course we have higher and lower figures, but this average range is from Barrow-Agee Laboratories reports over this valley area this season. We will therefore theoretically leave a little lint on the seed and discuss 185# yield, including the bagging and ties.

It is difficult to figure exact dollar linter yields with a lack of knowledge of cuts per ton as related to our knowledge of the actual quality of individual mill productions, and I might add that most mill men are inclined to generalize and make most generous statements about their lint yields.

It is fine to say the desirable characteristics in linters as related to marketing are to be clean, long fibred and have good color. Economically it is almost impossible to have all of this and a comparable or better dollar yield than competition. Here are three situations.

Now the producer who cuts 30# of first cuts does not generally get the differences on an assumed constant factor of 185# total take or 155# of second cuts. The chances are that his lint room is not balanced on this type of production. One mill we are thinking about sold this first cut at 7.25¢ or $2.17 and we will grant him the total of 155 seconds at 3¢ or $4.65, or a total of $6.82. This grade (in our opinion) could be raised considerably by changing beater technique.

Another producer is cutting 90# of first cuts and 115# of second cuts. The way he does this is by beating 20# of his first cuts out and throwing the beater tailings into the second cut line. His 70# net first cuts are bringing comparable to the 7.25¢ 30# cut, that is in the same marketing period -5 1/2¢ or $3.85 and 115 seconds at 3¢ or $3.45, or $7.30 total.

Another producer is cutting 65# first cuts at 6¢ or $3.90 and 120# seconds at 3¢ or $3.60, or $7.50 total. This is taking for granted a 73% yield in each case, and all of these, I repeat, are figured in the same marketing period.

Now, who is the best off? The answer is fairly complicated. The light production man has one answer. This is a lint that is popular and easy to sell. Presumably he would have to get 10¢ a pound to stay in the race. Power cost pick up on more seconds probably balances the lighter power costs on firsts. If your lint room will line up for this type of production, there is always a good demand for top quality lint. Most mills would have to shift a lot of machinery and flue lines to balance up, and when you got through with all of this, the buyer's are out looking for cheap 3M- 3H linters. The big demand in first cuts is something good enough at a cheap price.

The next producer, who is cutting the 90# and beating the whey out of his first cuts, is operating to qualify in a very popular price market. His job is to keep a real clean, heavy cut coming. He can always sell it, but no one knows how much it costs to make and maintain this type of quality.

This producer picks up a windfall occasionally on specialty orders requiring an unusually clean, but not too long fibred lint. The last man consistently has the best chance (maybe) to go places. He has a chance to improve quality without loss of yield. His mill is easier to balance and the great demand for a good fibred 3M - 3H that will garnett finds a source of supply here.

We obviously cannot discuss too many types of production from a marketing angle, so we will confine it to these three broad types, however, in making all of these three general types of first cuts a specific objective of sales must be considered, and each end user has his preference. We eventually sell our first cuts and anything you make will find a home at a price. The carryovers are always held for specific reasons. We think a deliberate plan to balance your lint room for definite production goals is desirable. Flexibility to jump from one type to another is fine, but quite difficult and requires excessive lint room equipment. Our biggest market is automobile felt, and this is the 3H, good fibred lint we recommend.

We think all of this heavy and particularly high speed beating has a tendency to shorten fibre lengths in first cuts. A slow gentle mix for uniform quality is desirable, and a good beater in reserve for off quality seed is not bad. High speed beaters and over loaded beaters seem to be the style. We think it is like playing a long play 33 rpm record on a 78 rpm phonograph.

Just yesterday, I was running an oil mill in Shelby, Mississippi. We made millruns. Our yield was 100 to 125# of millrun linters. The Tubize people bought millrun linters all through the Delta at this time. They were very particular about quality and even went so far as to regulate the speed to 400 rpm on the linter saws at mills contracting lint to them. The millrun linters have had a few friends in the paper trade. This paper trade is going through a trial and error period insofar as required raw materials are concerned. Lately this paper trade has been buying purified first cut linters in a big way. These are made of very clean, medium fibre, well beaten first cuts of a grade of government # 3M Valley. Longer fibred lint, as well as shorter fibred lint has not been satisfactory, and the master condenser, flue and individual condenser lint does not (so far) process to the best advantage in this field.

Millrun linters do not work out too well for any trade other than this paper trade, and it is doubtful whether the arithmetic is too attractive at any time.

Individual condenser linters are quite popular still, but such concentrated supervision is necessary with this type of equipment to get any degree of uniformity as to discourage many producers.

The lost art of saw filing is being revived with side filing and new revolutionary type equipment. The biggest and easiest dividend in linters may possibly be found in this field. I say possibly, as part of this is now in the experimental field.

A whole lot of improvement in first cut quality, again without loss of cut, is possible through the proper location of linter machines, properly balanced, with the right number of tons of seed per hour going through, and with the rolls, floats, etc., adjusted to proper speeds. Splitting first cuts and second cuts into 1, 2, 3 and 4 cuts, and blending in the

flue lines is done extensively in the West. We are not quite sure whether this practice improves or hurts linter quality. Some saving in h.p. is presumed.

It is well to emphasize before we swing over to second cuts that well cleaned seed are a great boon to linter quality. Our first cut machines clean the seed some more. After primary cleaning, many mills throw these tailings of motes and front throw outs, and what not back into the second cut seed line. I do not think it is worth the trouble, and besides the motes will sell by themselves. This so-called salvaging or recycling of tailings is a general and real threat to quality. Particularly is this threat to quality real at this time, as the demand slows for the munitions grade of linter pulp, and the bleachers accordingly tighten their quality requirements.

A linter machine is not a cleaner, however, and seed cleaning should be done to the best advantage in the cleaning room. The idea deliberately of putting non-cellulose material into second cut linter machines and then beating it out is comparable to a ginner putting his cleaning refuse into the seed he ships to his oil mill customer.

I wish this laboratory or some machinery manufacturer would design and sell a really efficient mote machine to my customers.

Second cut linters in this area are sold and made to be sold to the chemical trade. This contemplates selling cellulose. Many think the 73% cellulose basis we use is a mysterious sort of a formula. Actually, it means simply this. A bleacher starts 100# of linters through his plant. When it comes out at the other end about 98% pure alpha cellulose at the same beginning moisture he will get 73#, or whatever, according to the cellulose yield of the original 100# of second cuts. Anything you ship that runs your analysis down, therefore, counts against your price.

The beating process at the end of the line on second cuts beats out a lot of the cellulose and a lot of dirt. Our greatest problem for research is how to keep the cellulose and lose the foreign matter. Part of this can be accomplished by the brushless linter attachments with the multiplicity of possible settings and adjustments.

The export and mattress market on second cuts are now supplied from other areas and other productions, however, the pattern of marketing on second cuts may be somewhat upset from now on. Freight rates on California and Arizona second cuts have been lowered to consuming centers. The Texas producers have filed for a similar reduction, which if granted, will give the Valley serious pain. This thing of displacing distribution by transportation reductions could throw the entire export market into the Valley and require Valley producers to make export type seconds. To Chicago from Fresno $1.29, from Lubbock $1.05, from Little Rock 80¢, from Memphis 53¢ are given as illustrations.

Second cuts figure in the battery box and linoleum pattern. This will probably continue on a basis of about 25,000 bales per year in battery boxes and around 20,000 bales per year in linoleum, although the battery box people are finding some substitutes. A better than normal percentage of this trade is supplied from the Valley.

We can compete with wood pulp. With all due respect to our good friends and hosts here at the Regional Laboratory, I say this: We can

compete with wood pulp if the support program on linters is discontinued. The people who have been using our second cuts are unwilling to continue with us, not knowing whether there is an available supply of linters at the market. The market in this sense is not something to be established by edict. Maybe such a process establishes a good price at that, but any such fixation gives our competitors a chance to cut under us without fear of retaliation. The Department fixes the floor, and then the linters do not sell and are tendered. Our erstwhile customers then buy Russian first cuts and wood pulp, and draw farther and farther away from us. The consumption figures and export-import figures give us some answers. A summary is attached to this paper. (A complete statistical statement was prepared on the linter situation.)

DISCUSSION

Smith: Will you please repeat what you believe is the best combination of cuts?

Manley: It seems to me that we could make linters most popular on the market by doing as the third man in my paper- cutting 65 pounds of first cuts and 120 pounds of second cuts. This man consistently has the best chance to go places. He has a chance to improve quality without loss of yield, his mill is easier to balance, and he helps supply the great demand for a good fiber that will garnett.

Rogers: I would like to answer an earlier question relative to the use of rayon in paper making. When the rayon people finish making rayon, the cellulose content is lowered to such an extent that there is little strength, the bonds are all broken, and after making paper there is nothing there. In 10 or 15 years the big use for cotton linters will still be in the Northern pulp business. The only use in which cotton linters could have a definite advantage over woodpulp is one in which the physical characteristics of the fiber would have some advantage.

Brawner: Is the cellulose from woodpulp as good as that from cotton linters?

Rogers: Yes, Rag pulp paper could be better made from cotton linters, (alpha cellulose) if the thick walls could be broken down chemically to yield a product easier to hydrate. Fibrilation helps to give a uniform, smooth sheet; but in addition the material must hydrate.

Brawner: About two years ago you gave us an estimate of the price of second cut linters reduced to compete with woodpulp. Would you bring us up-to-date on that?

Rogers: Since then, it has dropped 3 or 4 times below my previously given price. Now though, I believe it still will have to be 2 1/2¢ to 3¢. It changes everytime the market fails.

Verdery: Do you believe that if potential users could be convinced that cotton linters prices would remain stable, that they might begin using linters again?

Rogers: Yes, if they wait four or five years. It will take that long to do it. There is a definite disadvantage to cotton linter pulp - the material left on the filter is much greater in the case of cotton linters as compared with that of wood pulp, and that is a big item of cost. It

can be filtered out at a cost, but they think the product from the wood pulp gives them the best product for the cost.

RELATION OF HULLING AND SEPARATING TO PROTEIN CONTROL

By

R. D. Long
Carver Cotton Gin Company

Separation can actually be broken down into two parts - separation and protein control. To get both of them at one time is difficult. It is very important to have a safety shaker as the material enters the separating room to scalp out any light material, light lints or meats that come from the linters. These materials going through the hullers will cause too much absorption. It is also helpful to have a surge bin to regulate the flow of material going through your separating room. Since the third cut linter is being used by more mills we find that we have a more uniform delintered seed which makes it easier to separate.

Unfortunately, the protein and moisture in seed will vary from day to day, making it impossible to accurately control the protein in the finished products, regardless of the fact that purifying equipment was used, and the amount of supervision applied. Most mills do not receive a protein analysis of their meal within twenty-four hours after it is produced and by this time it is likely that a normal variation in seed will have affected results and therefore all that can be expected from the conventional protein control equipment is to strike a happy medium and get as near 41% protein as possible. The best way to control this is by having a bran bin and adding bran back while the meal is being ground to assure accurate protein in the meal.

A good purifier will not control your protein alone - the entire length of separating machinery must be designed with the view of protein control.

Remember the handling of material is essential for protein control as well as good separation. Inadequate arrangements or design of equipment for handling the purified tailings is responsible for more bad separation results than any other single thing.

Proper hulling is one of the most important factors in the separating department. Better results have been obtained generally by operating at a huller speed somewhat slower than indicated by some of the recorded information when we had high moisture seeds. Five hundred RPM is considered a very good speed on the moistened seed that we have had to contend with during the last couple of years. For highly moistened seeds we usually have to run from 700 to 800 RPM. Huller knives should be changed on an average of every few weeks, but a good way to check this is watch absorption in the hulls. When absorption begins to climb it is a good idea to check the huller knives to see that they are not rough or if they're tight.

DISCUSSION

Smith: What would be the proper level to make the protein in the cake from processing seed with 4 to 4.2% ammonia?

Long: With that much ammonia in the seed, 44 or 45% protein cake could be easily made; it would be to advantage to make a higher protein cake and increase the press room tonnage by additional use of screw presses, and then add the bran back through the meal vent.

Jones: Can the addition of bran be controlled very accurately?

Long: It can be controlled accurately with a vent that is designed properly to feed evenly, and not choke up or jam in the bin. The feed can be kept geared down with a variable speed feeder at a reasonably even flow.

Jones: Does the ammonia in the seed fluctuate enough to throw the feeding arrangement off?

Long: Not too much. When you obtain the moisture on the cake you will know how much bran will have to be added to bring it up to the desired protein level.

Jones: Would you take an average moisture analysis of a 30 or 40 ton holding bin?

Long: Yes. However, if you have a control laboratory at your mill, it wouldn't be necessary to have a bin that large.

PREPARATION OF MEATS AND PROCESSING CONTROLS FOR SCREW PRESS AND HYDRAULIC OPERATIONS IN ORDER TO OBTAIN

(a) LOW FREE GOSSYPOL AND HIGH PROTEIN SOLUBILITY

(b) LOW REFINING LOSS AND OIL COLOR

By

E. A. Gastrock
Southern Regional Research Laboratory

The purpose of this talk is to review the various unit operations in processing cottonseed by the hydraulic and screw pressing methods and show how they affect these four characteristics.

The discussion will be confined largely to the factors influencing these four characteristics while the seed is being handled at the mill.

Low Free Gossypol and High Alkali Solubility

These characteristics of the meal are of extreme importance in developing extended markets for cottonseed meal in rations for poultry and swine. The meal accounts for from 35 to 40% of the value of the products from a ton of cottonseed.

Practically every operation used tends to reduce the free gossypol content. That is fine, you say, but - practically every operation also will lower the alkali solubility, which is bad.

During storage of the seed under favorable conditions little change occurs in either free gossypol content or alkali solubility; however, changes occur in the toughness of the pigment glands. The glands in old seed are harder to break and thus it is more difficult to get a low free gossypol

value in meal at the end of the season than at the beginning.

Conditioning and Tempering are used to help the rolling operation. The addition of moisture will help break the pigment glands. Slightly elevated temperatures will also help break the glands but any elevation in temperature will lower the alkali solubility.

Rolling with heavy duty rolls that are not overcrowded will do much to lower the free gossypol. Rolling, by itself, that is, eliminating the temperature effect, has no adverse effect on alkali solubility. Vigorous rolling is recommended. This has long been the practice for hydraulic pressing but is now recognized as being equally important for screw pressing.

The cooking operation involves moisture, temperature, and time. Increasing any of these will lower the free gossypol. It is possible by cooking in connection with vigorous rolling to achieve free gossypol values of 0.04% or lower. Unfortunately, however, there will be a decrease in alkali solubility. The value usually found will average about 60% but it is possible to achieve values of 70% and higher by avoiding the high temperatures sometimes used. The rolling and cooking operations were neglected for screw pressing for a long time. They are now recognized to be as important for screw pressing as for hydraulic pressing.

Low Refining Loss and Oil Color

These two characteristics are of extreme importance in maintaining the competitive position of cottonseed oil with respect to other edible oils and fats. The oil accounts for from 45 to 50% of the value of the products from a ton of cottonseed.

Cottonseed oil is a complex mixture of many constituents, most of which are present in small amounts. All of these constituents have a great effect on the refining loss and one group, the pigments, is responsible mainly for the color. The purpose of refining an oil is to remove the free fatty acids, most of the dark color and improve the flavor. Ideally, the refining losses should be equal to or only slightly greater than the total amounts of fatty acids and pigments materials present. Actually, the refining loss, as measured in the laboratories, is usually much greater. This increase is due to materials such as gums and phosphatides which are removed during refining along with the free fatty acids and pigments and, in addition, to emulsified neutral oil, carried out with the soapstock. The gums and phosphatides are excellent emulsifiers.

Adequate rolling and cooking helps solve these problems also. When higher moisture values are used during cooking there is evidence that gums and phosphatides as well as gossypol are bound to the meal sufficiently so that they are not removed with the oil during pressing. It is obvious that the yield of crude oil is reduced thereby but since the refining loss is reduced to a greater extent the yield of refined oil, and hence the dollar value should be greater. The low moisture values required in the completely cooked meats for screw pressing counteract in some degree the benefits derived from higher moisture used in cooking.

During the hydraulic pressing step, itself, there is very little additional (good or bad) that happens to the oil and meal. Practically everything that could be done to get a good yield of oil and good quality products has already been done. However, there are several other points that are important with respect to oil color that apply mainly to screw-pressing.

During the screw pressing step additional pigment glands may be broken. The pigments thus released will go mostly into the oil. In addition, high temperatures are attained in the press due to the amount of energy consumed in exerting pressure and shear on the cottonseed meats during pressing. These temperatures are usually much higher than those used during cooking. The effects of these high temperatures are magnified by any failure to cool the oil produced as rapidly as possible to ambient temperatures. Oil kept at elevated temperatures for even a few days - we might almost say, hours - will darken appreciably if the gossypol content is high enough. This value is about 0.10% or 0.20%, however, even the lower value cannot be considered safe. Some oils may contain as much as 1.0% of gossypol. That is why rolling and cooking are so important for oil color. The gossypol is bound to the meal and cannot get into the oil.

Exposure of the oil to air, especially if the oil is hot, should be avoided. Gossypol is usually removed from the oil very thoroughly by the refining procedure. However, if oil containing gossypol remains at elevated temperature or is exposed to air, chemical changes may occur to the gossypol and other pigments also. These changed pigments may not be removed adequately by the alkali refining and in addition may not be removed by the bleaching earth.

(c) MAXIMUM CAPACITY WITH RESPECT TO SHAFT SPEED AND RESIDUAL OIL

By

John W. Dunning
V. D. Anderson Company

In our pilot plant work in Cleveland studying the extraction of cottonseed,we moisten the meats to approximately 12 or 13% and warm to 140°-145°, and then roll in a regular 2-pair flaking roll, under which conditions we were able to get low gossypol and maintain the soluble protein level at about 70%. Pressing tests will be conducted this spring to see if screen conditioning ahead of rolling, and very very fine rolling permitted thereby have any effect on this sort of work.

The soluble protein is very high for an expeller mill, so high that the oil was checked several times. From 1940 to 1948, most Expellers were being operated at approximately 22 RPM, and the reliable data that I have indicates that 24% of the mills were between 3 and 4% residual oil, and 76% of the mills were under 5% oil. In 1953 we compared data supplied by about 22 mills; between 1948 and 1953 a considerable change in cottonseed expeller processing was realized. During the 1954 - 1955 milling season data have been received from different mills that show still a further decrease in residual oil at any one capacity. One mill was operating at about 42 tons of seed capacity per day per machine and was obtaining about 3.7% residual. They decreased the capacity of the Expellers from 42 to 37%, which then reduced the residual from 3.7 down to roughly 3.5. In decreasing their capacity however, they increased the cooking capacity so that the residual oil actually obtained was 3.0%. We are finding out this year, that increase in capacity has a specific

effect.

It is apparent, that one has to state the protein content of the meal or the cake and the meal yield from the seed in discussing the relationship of capacity to residual oil. I selected three mills that best illustrate the effect of protein content and meal yield on residual oil and capacity. In Mill A, the processing of 50 tons of seed per expeller yielded 950 pounds of cake per ton of seed, at 41.5% protein and 4.1% residual oil. In Mill B, 53 tons of seed per day were processed, yielding 828 pounds of cake per ton at 45.6% protein content. Now if Mill A were running the same 1980 pounds of cake per hour using Mill B seed it may be calculated that Mill A could run 57.4 tons of seed a day. Likewise if Mill B would cut this cake at 3.7% oil and 45.6 protein, to 41% protein it would end up with 3.47% residual oil in meal. In Mill C, 699 pounds of cake per ton were obtained at 46.9% protein and 4.3 residual oil. If that cake were ground and blended with hulls it would have 3.16% residual oil in meal.

The summary of the effect of shaft RPM on capacity and residual oil is tabulated below:

MILL DATA

Mill No.	# Cake/ Ton	Tons Seed Per Expeller Per Day	Oil In Cake %	Protein In Cake %	# Cake/ Hr.	Oil In Meal At 41% Protein
A	950	50	4.1	41.5	1980	4.1
B	828	53	3.7	45.6	1830	3.47
C	699	--	4.3	56.9	----	3.16

As a result of this steady improvement in capacity and residual oil that oil millers have obtained during the last five years, it is apparent that one cannot state maximum capacities or minimum residual oils. In view of this work accomplished by oil millers, in view of lower initial investment, lower maintenance and simplicity of operation, it is our belief that the capacity of the Expeller should be further increased. This Spring, therefore, Anderson will offer a slightly revised model of the Super Duo Expeller designed specifically to handle 50 plus tons of cotton seed per day and which will permit the attaining of those low oils in cake reported by a few mills during the '54-55 season.

(d) EXTENSION CAGE AND OTHER DEVELOPMENTS AS TO LONGER DRAINAGE

By

A. W. French
French Oil Mill Machinery Company

As we look back over the years, there are many mile stones which ushered in a new era of improvement in press room operation, the hydraulic end charging cake former, the stack type of cooker, but in our opinion, the most important development was long pressing time.

Similarly, although the adoption of good rolling and hydraulic stack type of cookers has been important to the improvement of screw press operation, in our opinion, by far the most important contribution has been our development of long pressing time combined with high pressure for screw presses.

In an effort to apply to screw presses what we knew pertaining to the advantages of long pressing time, several years ago we added a 9" extension cage to our standard 4-section cage screw press. The press then had an 11" low pressure auxiliary cage in the feed hopper, four 11" sections in the main cage, plus the 9" extension, or a total of 64" of drainage, 7" in diameter. In two installations out of three, our customers reported a noticeable improvement, averaging three or four tenths lower oil in cake. Some could find no improvement. No doubt this was because something else was out of balance. This was reminiscent of the early experiences with long pressing time on hydraulic presses.

To go beyond 9" with extension cages on an existing screw press required some quite original thinking and considerable designing on our part but about a year ago we were realizing from several test installations, that our efforts in making these changes, change over parts, and in perfecting them over a period of a year, had been well worthwhile. It has not been easy and we had several failures before we had success. We had a lot to learn about the best way to go about it, but we finally emerged with what we think is the greatest improvement in screw press operation ever made.

Our first design of the double extension cage added an 11" section to a press set up with a 9" extension cage, thus we had a total of 75" of drainage. Then we redesigned it to use an 11" integral extension cage in place of the 9" one, water cooling it also, as was the final extension cage. This gave a 77" drainage, all water cooled, 7" in diameter.

An important incidental design incorporated in this construction was our new easy-view safety cone. For years we have been trying to find a solution to the very dangerous hand mangler that resulted from a cake cutter revolving in a rather dark spot where operators from time to time have taken a chance on being able to grab a piece of cake and sometimes lost.

We managed the change in the design of our press without increasing the overall length. Our new design cone is absolutely safe and an operator can see exactly the structure and texture of the cake being made from most any part of the mill.

In consideration of our old customers, we also designed this unit so that it could be applied to existing presses and so that the customer's

present shaft could be used.

For the first time in history it has been conclusively proven possible to operate a screw press mill leaving consistently less than 3 percent oil content in finished meal, week after week, without scorching or darkening the cake, and at the same time the press makes as good a quality oil as has ever been made on any kind of pressing equipment on like seed. We have consistently produced oil in finished meal in the neighborhood of 2.50 percent in some installations and at that, those installations were just average oil mills, well engineered and well designed but without any specialists or technical experts out of the ordinary.

Because of efficient cooling and proper proportioning of our design, we have had no scorching of the meal and it is still the same bright meal which has always characterized our press. Neither has there been any damage to the oil but quite to the contrary, the oil quality, as a whole has improved. The protein solubility of the meal seems to be improved also. With our double extension cage operating to give an oil in cake around 2.50%, we have had a protein solubility of 65% reported by enthusiastic customers.

We now have high capacity and long pressing time and high pressure all in one machine.

Again, this time with screw presses, long pressing time is paying a dividend worth having to the oil mill.

DISCUSSION

Taylor: What is the depth of the rings on a 100" cooker.

French: We are making our range deeper gradually. In our regular stack hydraulic cookers 34 to 40" is very common, but when we went to screw presses we put an individual feeder on each press, and found that a four high 72" cooker for 45 tons of cottonseed was a lot of cooker. For the period that a shallow depth was desired we made our rings 20" deep. In the light of modern thinking we think the rings ought to be deeper. Those individual cookers you saw on the picture are 5 high 100" cookers with rings 25" in depth but if I were to design it today I might make the top ring 30". I'm a little partial to a little more depth up there. So you can take your choice, as to how deep you want to carry it, if you have got the depth, its up to the operator to choose. If you haven't got the depth, you've got to take what the machine has. We are making an individual 72" cooker now, with two top rings 30" deep and three bottom rings 20" deep.

(e) EFFECT OF COOKING CONTROLS ON HYDRAULIC OPERATION

By

O. H. Sale
Fertilizer Equipment Sales Corporation

Our moisture-temperature studies were made with data taken at the Perkens Oil Mill. Various moistures were employed on the rolls, and moisture was added in the cooker through a spray of conventional type

and as live steam in the top section. It has been definitely established that after the temperature in the cooker passes the boiling point of water, that in a range the temperature begins to be the function of moisture loss. A number of people who cook have made the same determination I have. This proves to us fairly accurately that our findings illustrate actually what happened. The higher the temperature the lower the moisture in the cook, and not only these tests, but all that I have ever seen will follow almost that pattern entirely. There has been a lot of controls used and we have started off with very elaborate controls on all cookers. In the case of the hydraulic mills, in which 5 high cookers are usually used, controls with proportional bands and other features are employed extensively, resulting only in the confusion of the ordinary operator. It is better to use ordinary reducing valves for setting steam pressures so that desired temperatures may be realized at the cake former. This may apply to screw presses, also, for which I understand the cook must be somewhat drier, and permits fairly inexpensive self-control. If we have a dual control with two pins on it that would control live steam going into the top kettle and the jacket steam, moisture in the top cooker can be controlled at the desired level. By having a recording thermometer on the bottom kettle, you have a record of the end results. It is better to have a recording thermometer on all the kettles but it is not absolutely necessary. Then there have been cases where you didn't have any, anything except indicating thermometers on the three bottom kettles which has worked out satisfactorily if they are watched closely enough. A good superintendent in some instances can control the live steam going into the top cooker with a reducing valve and just a steam gauge. That has worked out very successfully when a man knows what he is driving at and will watch it closely enough, but I would say the cost of instruments to put the best control on the top two kettles, and the recording thermometer on the bottom would total less than $1,000.00; and under ordinary living conditions they would pay off.

DISCUSSION

Lyle: I would like to ask Mr. French if he checked the temperature of the cake from the 9" extension cage, and 22" double extension cage?

French: No, I wish I knew how to check it. I do not know which it would be, warmer or cooler than the standard length of press, but I know its appearance is the same. What do you think Charlie?

Caldwell: I think it is cooler with a longer barrel.

Lyle: At what temperature will oil in the meal oxidize, or carbonize, or evaporate. In other words if you raise the temperature of the meal to around 270 or 280 degrees Fahrenheit will a portion of the oil disappear?

Mays: I do not think so.

Lyle: In the meats?

Mays: No

Fowler: We have taken meat samples and put them in ovens at various temperatures as high as 300° and we couldn't find any particular difference in residual oil by analysis.

Mays: Something unusual happens with soybeans that doesn't happen with cottonseed. You can take a soybean cake and by the time you have added water to it, it goes through a little steaming process and when you analyze it the oil content will be a little higher in the finished meal with water added than it was in the cake to start with.

Verdery: A lot of people claim that to be true of pellets, where you have to add more water. I still do not believe it, but they keep showing me samples, in which it has taken place.

Gastrock: I think the analysis of any sample of course is an empirical value. It doesn't necessarily represent the amount of oil that is in there. It is the amount of oil that the extraction procedure takes out. Now, if something happens to a sample, which makes any oil content that is present more extractable well naturally you will get a higher result, and there is some evidence to the fact that if you do some subsequent processing, not only water addition, but some addition of heat, such as might take place in a pelleting machine, or it might take place in the granulating or flaking for solvent extractions of prepress cake, you might get a higher analytical result which would represent the more materials that might come out of that test, but you can not manufacture oil that way.

RESOLUTIONS

February 8, 1955

The following resolutions were presented by Messrs. J. B. Snell, N. F. Howard, and Zack McClendon to the Association, and they were unanimously adopted:

1. WHEREAS: It is recognized that the processing of oilseeds, and especially cottonseed, is becoming more and more a chemical process and we are recognizing to a greater extent the necessity for tying our crushing operations more closely to the laboratory in order to ascertain and determine the chemical make-up of our various products, and have entered into a period where we cannot ignore the fact that our very existence as a crushing industry may depend on laboratory and chemical guidance, and

2. WHEREAS: The members of the Valley Oilseed Processors Association, Inc., are becoming aware of the value of chemical research and the benefits to be derived from the assistance and guidance which the laboratory offers as evidenced by the healthy increased attendance at this Fourth Conference, therefore,

3. BE IT RESOLVED: That the members of the Valley Oilseed Processors Association and other kindred interests here assembled express our thanks and our deep appreciation to the members and personnel of the Southern Regional Research Laboratory who have participated in this Clinic and have contributed to its success, by making the personnel and facilities available, and

4. BE IT RESOLVED: That we as participants commend and thank Mr. I. H. Fleming, Jr., President, Mr. Allen Smith, Program Chairman, Mr. C. E. Garner, Secretary and all who have participated in the preparation and carrying out of the program and contributed to the success of this meeting.

Signed: ______________________________
RESOLUTIONS COMMITTEE

J. B. Snell, Chairman
N. F. Howard
Zack McClendon

APPENDIX

P R O G R A M

February 7, 1955 - 9:30 a.m.
Auditorium-Third Floor

Chairman, E. A. Gastrock, SURB

1.	9:30 a.m.	Welcome - C. H. Fisher, Chief, SURB
2.		Response - I. H. Fleming, Jr., De Soto Oil Company, Memphis, Tennessee, President, V.O.P.A.
3.	10:00 a.m.	Status On Research On Improving Nutritive Value of Cottonseed Meal A. M. Altschul, Head, Oilseed Section, SURB
4.	10:30 a.m.	The Color Problem of Cottonseed Oil F. G. Dollear, Oilseed Section, SURB
5.	11:10 a.m.	Cottonseed Oil Foots F. C. Pack, Oilseed Section, SURB
6.	11:40 a.m.	Acetoglycerides - New Fats For Food Uses Audrey Gros, Oilseed Section, SURB
7.	12:10 p.m.	Free Gossypol and Protein Solubility M. F. Stansbury, Analytical, Physical-Chemical, and Physics Section, SURB
	12:40 p.m.	Luncheon - S.R.R.L.

February 7, 1955 - 2:00 p.m. Auditorium-Third Floor — Chairman, E. F. Pollard, SURB

8.	2:00 p.m.	New Approach In The Cleaning of Cottonseed L. L. Holzenthal, Engineering and Development Section, SURB
9.	2:30 p.m.	Preservation Of Cottonseed At Oil Mills by Refrigeration H. L. E. Vix, Engineering and Development Section, SURB
10.	3:00 p.m.	New Oil Crops For The South K. M. Decossas, Engineering and Development Section, SURB

February 8, 1955 - 9:00 a.m. Auditorium-Third Floor — Chairman, Ralph Woodruff, V.O.P.A.

11.	9:00 a.m.	Introductory Statements Ralph Woodruff, Committee Chairman Allen Smith, Program Chairman
12.	9:30 a.m.	Report On Progress In Removal Of Sticks From Seed Cotton At Gin A. L. Vandergriff, Lummus Cotton Gin Company, Columbus, Georgia
13.	10:00 a.m.	Developments In Cleaning Cottonseed At The Oil Mill M. C. Verdery, Anderson, Clayton & Company, Inc., Houston, Texas
14.	10:30 a.m.	Removal Of Sticks and Other Foreign Material At First Cut Linters (a) Use Of Wire Slide Redding Sims, National Blow Pipe & Manufacturing Company, New Orleans, Louisiana (b) Other Methods Dick Taylor, Southland Cotton Oil Company, Waxahachie, Texas
15.	11:00 a.m.	The Importance Of Increased Economy And Efficiency In Delinting Cottonseed J. H. Brawner, Southern Cotton Oil Company, New Orleans, Louisiana
16.	11:30 a.m.	Measuring Linter Room Losses M. H. Fowler, The Buckeye Cotton Oil Company, Cincinnati, Ohio.
17.	12:00 noon	Utilization Of Cotton Linters For Paper Making M. D. Woodruff, The Bauer Brothers Company, Springfield, Ohio
	12:30 p.m.	Luncheon - S.R.R.L.

18. 1:30 p.m. Desirable Characteristics In Cotton Linters As They Relate To (a) Production (b) Marketing
W. C. Manley, Jr., Memphis, Tennessee

19. 2:00 p.m. Relation Of Hulling And Separating To Protein Control
R. D. Long, Carver Cotton Gin Company, Memphis, Tennessee

20. 2:30 p.m. Preparation Of Meats And Processing Controls For Screw Press And Hydraulic Operations
(a) Low Gossypol And High Protein Solubility
(b) Low Refining Loss And Oil Color
E. A. Gastrock, Head, Engineering and Development Section, SURB
(c) Maximum Capacity With Respect To Shaft Speed And Residual Oil
J. W. Dunning, The V. D. Anderson Company, Cleveland, Ohio
(d) Extension Cage And Other Developments As To Longer Drainage
A. W. French, The French Oil Mill Machinery Company, Piqua, Ohio
(e) Effect Of Cooking Controls On Hydraulic Operation
O. H. Sale, Fertilizer Equipment Sales Corporation, Atlanta, Georgia

21. 3:50 p.m. Resolutions

22. 4:00 Adjournment

ATTENDANCE LIST

Anderson, R. F., Delta Cotton Oil Co., Jackson, Miss.
Barnett, J. P., Jr., Cotton Products Co., Inc., Opelousas, La.
Barton, R. C., The Forrest City Cotton Oil Mill, Forrest City, Ark.
Beckham, Otis M., Osceola Products Co., Box 192, Osceola, Ark.
Berkley, Earl E., Acco Fiber & Spinning Laboratory, 417 La Branch, Houston, Tex.
Blackshire, Herman, Fort Smith Cotton Oil Co., Inc., Box 819, Fort Smith, Ark.
Bookhart, John, Southland Cotton Oil Co., Jackson, Miss.
Brawner, J. H., Southern Cotton Oil Co., New Orleans, La.
Bredeson, Dean, V. D. Anderson Co., 3212 Medina Ave., Fort Worth, Texas
Bryson, J. H., Jr., Dothan Oil Mill Co., 200 S. Park Ave., Dothan, Ala.
Bryson, R. B., Dothan Oil Mill Co., Dothan, Alabama
Byram, J. E., Jr., Red River Cotton Oil Co., Alexandria, La.
Caldwell, C. H., West Memphis Cotton Oil Mill, West Memphis, Ark.
Cantrell, William C., Bauer Bros. Co., Fort Worth, Texas
Coleman, W. T., Western Cottonoil Co. Division, Anderson Clayton & Co., Abilene, Texas
Dillard, E. L., Dothan Oil Mill Co., P. O. Drawer 458, Dothan, Ala.
Dunning, John, The V. D. Anerson Co., 1935 W. 96th St., Cleveland 2, Ohio
Durham, Warren A., National Blow Pipe & Manufacturing Co., P. O. Box 67, New Orleans, La.

Finegan, John J., Jr., Middle South Area Office, 211 International Trade Mart, New Orleans, La.
Fleming, I. H., Jr., De Soto Oil Co., Memphis, Tennessee
Fowler, M. H., The Buckeye Cotton Oil Co., Cincinnati, Ohio
French, A. W., The French Oil Mill Machinery Co., Piqua, Ohio
Gandy, Dalton E., National Cottonseed Products Association, Ruston, La.
Garner, C. E., Valley Oilseed Processors Association, 1024 Exchange Building, Memphis 3, Tenn.
Gilbert, R. A., Arcadia Cotton Oil Co., Arcadia, La.
Gile, E. D., Cotton Products Co., Inc., Opelousas, La.
Ginaven, M. E., The Bauer Bros. Co., Springfield, Ohio
Greene, T. W., Fort Smith Cotton Oil Co., Inc., Box 819, Fort Smith, Ark.
Harper, Garlon A., National Cottonseed Products Association, Dallas, Texas
Harris, Hal, Planters Oil Mill, Greenwood, Miss.
Hayne, W. P., Independent Mill & Gin, Alexandria, La.
Henry, Dan L., Law & Company, P. O. Box 1558, Atlanta 1, Ga.
Hicky, James, Forrest City Cotton Oil Mill, Armour & Co., Forrest City, Ark.
Hodges, Lawrence H., Barrow-Agee Laboratories, Inc., Memphis, Tennessee
Hodgin, W., Southland Cotton Oil Co., Jackson, Mississippi
Hoover, I. M., Cotton Products Co., Inc., Opelousas, La.
Howard, Noland F., Planters Oil Mill, Greenwood, Miss.
Jenkins, Alfred, Delta Cotton Oil & Fertilizer Co., Jackson, Miss.
Johnson, Walter, Perkins Oil Co., Box 153, Memphis 1, Tenn.
Jones, O. J., Western Cotton Oil Co., Abilene, Texas
King, R. R., Mrs. Tucker's Products, Sherman, Texas
Klock, Thomas S., Red River Cotton Oil Co., Alexandria, La.
Long, R. D., Carver Cotton Gin Co., 146 E. Butler St., Memphis, Tenn.
Lundmark, J. C., The V. D. Anderson Co., 2016 Southwood Road, Birmingham 9, Ala.
Lyle, E. S., Dyersburg Oil Mill Co., P. O. Box 157, Dyersburg, Tenn.
Manley, W. C., Jr., 811 Falls Bldg., Memphis, Tenn.
May, Ralph W., The Union Oil Mill, Inc., Box 617, West Monroe, La.
Mays, J. R., Jr., Barrow-Agee Laboratories, Inc., Box 156, Memphis 1, Tenn.
McClendon, Zach, New Cotton Seed Oil Mill, Monticello, Arkansas
McClure, O. M., Southern Chemical Cotton Co., Chattanooga, Tenn.
McGinnis, A. S., Oil Mill Operating Div., Swift & Co., Union Stock Yards, Chicago 9, Ill.
Miller, J. E., Spencer Kellogg & Sons, Inc., Buffalo, N. Y.
Morgan, George C., Continental Gin Co., Birmingham 2, Ala.
Newby, Wales, Cotton Products Co., Inc., Opelousas, La.
Norris, F. A., Swift & Co., Union Stock Yards, Chicago 9, Ill.
O'Reilly, J. P., Esso Standard Oil Co., Memphis, Tennessee
Page, Bentley, Western Cottonoil Co., P. O. Box 191, Lubbock, Texas
Quinn, W. G., Jr., The Buckeye Cotton Oil Co., Memphis, Tennessee
Roberts, J. B., Dothan Oil Mill Co., Dothan, Ala.
Roberts, L. E., De Soto Oil Co., 998 Kansas Ave., Memphis, 6, Tenn.
Rogers, L. N., The Buckeye Cotton Oil Co., 2899 Jackson Ave., Memphis, Tenn.
Roullard, Fred, Jr., Producers Cotton Oil Co., Box 1832, Fresno, Calif.
Sale, O. H., Fertilizer Equipment Sales Corp., P. O. Box 1968, Atlanta, Ga.
Simpson, George R., Planters Oil Mill, Greenwood, Miss.
Sims, Edward C., Amory Cotton Oil Co., Amory, Miss.
Sims, Redding, National Blow Pipe & Manufacturing Co., P.O. Box 67, New Orleans, La.

Sitton, Augustus J., Pendleton Oil Mill, Pendleton, S.C.
Smith, Allen, Perkins Oil Co., Box 152, Memphis, Tenn.
Smith, F. M., Hazelhurst Oil Mill & Fertilizer Co., Hazelhurst, Miss.
Snell, J. B., Minden Cotton Oil & Ice Co., Inc., Minden, La.
Southall, H. L., Union Oil Co., Bunkie, La.
Taylor, Dick, Southland Cotton Oil Co., Waxahachie, Texas
Taylor, R. L., Arcadia Cotton Oil Co., Arcadia, La.
Thomas, Ralph W., Southern Chemical Cotton Co., Chattanooga, Tenn.
Turner, K. Lanse, Cotton Research Committee of Texas, Box 4190, Tech Station, Lubbock, Texas
Vandergriff, A. L., Lummus Cotton Gin Co., Box 1260, Columbus, Ga.
Verdery, M. C., Anderson, Clayton & Co., Cotton Exchange Bldg., P. O. Box 2538, Houston, Texas
Wallace, C. W., The Union Oil Mill Co., West Monroe, La.
Weil, Frank A., Chemical Plants Div., Blaw-Knox Co., 929 Brown-Marx Bldg., Birmingham, Ala.
White, C. E., Planters Oil Co., Tunica, Miss.
Wiley, A. L., Perkins Oil Co., Box 152, 727 Beale St., Memphis, Tenn.
Witz, H. J., Producers Cotton Oil Co. of Arizona, P. O. Box 1984, Phoenix, Ariz.
Womack, James, Engineering Experiment Station, University of Tenn., Berry Hall, Knoxville, Tennessee
Woodruff, M. D., The Bauer Bros. Co., Springfield, Ohio
Woodruff, Ralph, Osceola Products Co., Box 192, Osceola, Ark.
Woodson, Frank, Woodson-Tenent Laboratories, P. O. Box 2135, Memphis 2, Tenn.

PRESS RELEASE

(This press release of the Conference was furnished on February 11, 1955, to trade and technical journals serving the oilseed industry.)

Cottonseed Clinic stresses production of high quality linters, increased nutritive value of cottonseed meal, high quality of cottonseed oil, and continued cooperation between industry and research.

Resolutions looking toward continued cooperative research in the oilseed industry and close ties with the USDA Southern Regional Research Laboratory were adopted at the Fourth Cottonseed Processing Clinic, held jointly by the Laboratory and the Valley Oilseed Processors' Association in New Orleans, February 7-8, 1955. Industry representatives approved the following resolutions presented by J. B. Snell, Chairman of the Association's Resolutions Committee, from Minden Cotton Oil & Ice Co., Inc., Minden, Louisiana:

WHEREAS: it is recognized that the processing of oilseeds, and especially cottonseed, is becoming more and more a chemical process and we are recognizing to a greater extent the necessity for tying our crushing operations more closely to the laboratory in order to ascertain and determine the chemical make-up of our various products and have entered into a period where we cannot ignore the fact that our very existence as a crushing industry may depend on laboratory and chemical guidance, and

WHEREAS: the members of the Valley Oilseed Processors Association,

Inc., are becoming aware of the value of chemical research and the benefits to be derived from the assistance and guidance which the Laboratory offers as evidenced by the healthy increased attendance at this Fourth Conference, therefore,

BE IT RESOLVED: That the members of the Valley Oilseed Processors Association and other kindred interests here assembled express our thanks and our deep appreiation to the members and personnel of the Southern Regional Research Laboratory who have participated in this Clinic and have contributed to its success, by making the personnel and facilities available, and

BE IT RESOLVED: That we as participants commend and thank Mr. I. H. Fleming, Jr., President, Mr. Allen Smith, Program Chairman, Mr. C. E. Garner, Secretary and all who have participated in the preparation and carrying out of the program and contributed to the success of this meeting.

Eightysix representatives of cottonseed oil mills, equipment manufacturers, users of cottonseed products, and State and Federal agencies, in addition to staff members of the Southern Laboratory, participated in the 2-day meeting. In his opening remarks I. H. Fleming, Jr., President of the Association, pointing out the value of these meetings to the oilseed industry, said: "Our past meetings, made possible by you, have been interesting and profitable and I am sure this meeting and others to come will help materially to bring about progress in our industry."

On the first day E. A. Gastrock, Head of the Engineering & Development Section, SURB, presided over the morning session. Dr. A. M. Altschul, Head of the SURB Oilseed Section, reviewed the present status of the research on chemical methods of measuring the nutritive value of cottonseed meals. He stated that in the past year cottonseed meals of high nutritive value have been produced which have gone into new markets as feeds for poultry and swine; F. G. Dollear, Oilseed Section, reported on the color problem of cottonseed oil. He brought out that laboratory experiments have proven that gossypol is responsible for color reversion in cottonseed oil. F. C. Pack, Oilseed Section, discussed cottonseed oil foots. He reported that the Southern Laboratory has investigated the utilization of cottonseed oil soapstocks in the preparation of secondary plasticizers and in the alleviation of dust problems in the preparation of mixed and pelleted feeds. Miss Audrey Gros, Oilseed Section, gave a report on new fats for food uses. M. F. Stansbury, SURB Analytical, Physical-Chemical, and Physics Section, discussed the analytical methods currently in use for the determination of free gossypol and protein solubility of cottonseed meals, pointing out the reliability and precision of these methods.

In the afternoon Dr. E. F. Pollard, Engineering and Development Section, presided. L. L. Holzenthal, Engineering and Development Section, gave a report on new approaches to cleaning cottonseed; H. L. E. Vix and H. J. Molaison, Engineering and Development Section, reviewed theoretical calculations on the preservation of cottonseed at oil mills by refrigeration. They found that a hundred ton per day capacity mill storing 16,000 tons of cottonseed in four tanks at 45° F. can possibly be served with a 25 ton refrigeration system. K. M. Decossas, Engineering and Development Section, discussed the importance of new oil crops for the South. He outlined what

has been done and what is being done by production and utilization research groups to assist in bringing about the commercial production of new oil crops and pointed out the need for and further research in this field.

Ralph Woodruff, Osceola Products Co., Osceola, Ark., and Allen Smith, Perkins Oil Co., Memphis, Tenn., presided over the second day's program, presented by the Valley Oilseed Processors' Association, which emphasized again the problem of cleaning cottonseed to improve linters quality.

M. C. Verdery, Anderson Clayton Co., Houston, Texas, stated that some advances have been made in improving the quality of chemical linters, but that it is generally agreed that to solve this problem satisfactorily drastic improvements must first be made in present methods of seed cleaning.

A. L. Vandergriff of Lummus Cotton Gin Co., Columbus, Georgia, stated that modified gin equipment has been developed to remove sticks from seed cotton at gins. He said, "It will naturally take considerable time for these developments to come into general use. In the meantime the industry needs any help possible from you in the way of incentive and encouragement to the ginners to get this equipment into general use."

Redding Sims, National Blow-Pipe & Manufacturing Co., New Orleans, La., and Dick Taylor of Southland Cotton Oil Co., Waxahachie, Texas, discussed the use of wire slide, basket, and other methods for the removal of sticks and other foreign material at first linters.

J. H. Brawner, Southern Cotton Oil Co., New Orleans, Louisiana, discussed the importance of increased economy and efficiency in delinting cottonseed. He gave in some detail the cost of producing first and second cut linters at oil mills and concluded by saying, "It behooves all of us to do everything we can to increase the economic efficiency of our lint rooms."

Mr. H. Fowler, Buckeye Cotton Oil Co., Cincinnati, Ohio, discussed analytical measures of linter room efficiency. He said, "We have found lint loss to be most useful as a control and we use it routinely. It is most helpful in comparing new methods and equipment. By changing one thing at a time and watching the effect on lint loss, a better understanding of many linter room problems can be had."

M. D. Woodruff of the Bauer Bros. Co., Springfield, Ohio, discussed the present status of the utilization of cotton linters in the paper industry. Mr. Woodruff stated that the present approach to the utilization of cotton linters in paper making appears to be very sound as little is now known of the fundamentals involved. He added that while much time and money have been spent in trying to adopt existing equipment for the purpose, the results have consistently fallen far short of the requirements.

W. C. Manley, Jr., Broker - Cottonseed Products, Memphis, Tenn., and L. N. Rogers, Buckeye Cotton Oil Co., Memphis, Tenn., discussed the desirable characteristics in cotton linters as related to production and marketing.

R. D. Long of Carver Cotton Gin Co., Memphis, Tenn., discussed hulling and separating of cottonseed as related to protein control.

J. R. Mays, Jr., Barrow-Agee Laboratories, Inc., Memphis, Tenn.; J. W. Dunning, The V. D. Anerson Co., Cleveland, Ohio; H. W. French, French Oil Mill Machinery Co., Piqua, Ohio; O. H. Sales, Fertilizer Equipment Sales Corp., Atlanta, Ga.; and E. A. Gastrock of the Southern Laboratory; participated in a panel discussion of the preparation of meats and processing control for screw press and hydraulic operations. This discussion covered low gossypol and high protein solubility; low refining loss and oil color;

maximum capacity with respect to shaft speed and residual oil; extension cage and other developments as to longer drainage; and the effect of cooking controls on hydraulic operations.